MAY 1951

FOUNDRY

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Foundries that specialize in Quality Castings flux and desulphurize with PURITE

A modern cupola and forehearth installation used in the manufacture of farm equipment parts and critical machine castings at the Lynchburg Foundry Company, Lynchburg Plant.

Lynchburg Foundry Company—long famed for casting quality farm equipment parts, castings for the chemical industry, critical machine parts and iron pipe—relies on Purite to give increased fluxing action in cupolas and to reduce sulphur in ladle or forehearth.

Here's why so many leading foundries use Purite:

- Purite gives 100% fluxing action in the cupola—100% desulphurizing action in the ladle.
- Purite gets to the iron quicker—no faster desulphurizer made.
- Purite is time-tested and proven for unsurpassed desulphurizing uniformity.
- Purite comes in 2-lb. pigs—no weighing or measuring required.
- Purite is 100% fused soda ash—you do not pay for inert materials.
- Purite does not crumble—no waste—no dust.
- Purite can be shipped in bulk carloads at substantial savings over bag shipments—is easily stored without deterioration.

PURITE TRADE MARK is sold by all leading foundry supply houses in the United States and Canada.

Nearly 30 years of successful experience prove why Purite is today's outstanding flux and desulphurizer. Get full information on Purite's effectiveness—write today for new booklet, "Refining and Desulphurizing in the Cupola." Mathieson Chemical Corporation, Mathieson Building, Baltimore 3, Maryland.

PURITE 100% fused soda ash.

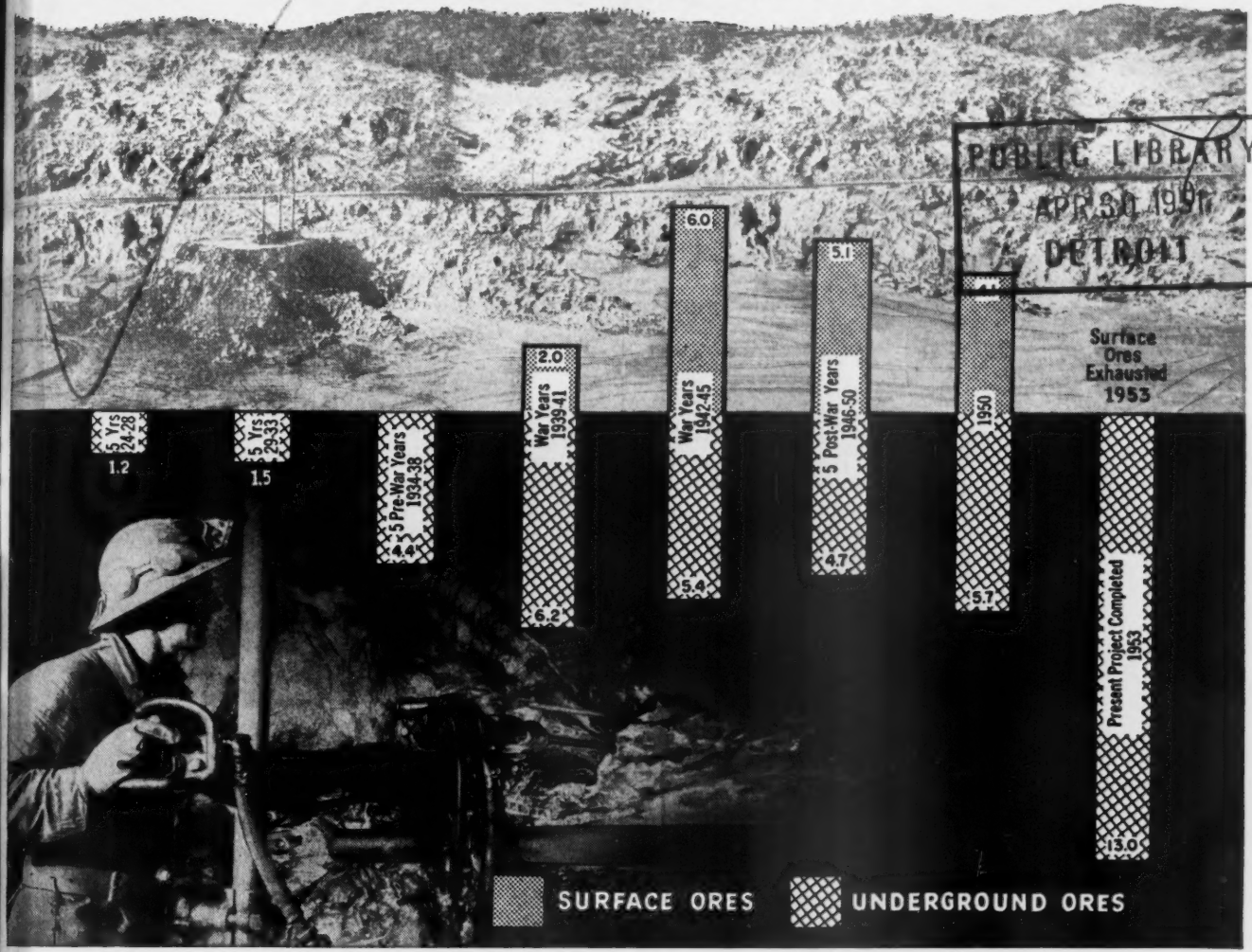
The Scientific Flux for Better Melting and Cleaner Iron.

Mathieson CHEMICALS

SERVING INDUSTRY, AGRICULTURE AND PUBLIC HEALTH

TECHNOLOGY DEPT.

Underground and surface ORE MINED (yearly average—millions of tons)



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DETROIT

Underground for Defense

...started more than 10 years ago

STRENGTH...military and economic ... depends on productivity. And productivity depends on men who have devoted long years to their specialized chosen field of endeavour.

Such men with "know-how" mine nickel from the rocky rim of Ontario's Sudbury Basin ...

By increasing output with maximum speed and drawing on reserve stocks of nickel previously accumulated, they helped raise deliveries of nickel in all forms during 1950 to 256,000,000 pounds ... a record for any peace-time year.

This record, 22% greater than the 209,292,257 pounds delivered in 1949, was no accident ...

In 1937, INCO launched a vast long-range project which now makes it possible to meet the military requirements of the United States, Canada and the United Kingdom. In addition, nickel deliveries are being made to government stockpiles and the balance of the supply is being rationed among civilian consumers in all markets throughout the free world.

Since the inception of International Nickel, its fixed policy has always been to increase the supply of nickel. To meet today's needs, INCO went underground years ago.

Anticipating the eventual depletion of Frood-Stobie open pit surface ores, more than 10 years ago, INCO embarked on a program of replacing open pit with underground capacity. This required extensive enlargement of underground plants, development of new methods of mining not previously undertaken and the revamping of metallurgical processes to cope with difficulties in recovering nickel from the new types and lower grades of ores which have to be reached.

Major expansion in output of nickel from underground operations is being driven to conclusion with utmost speed. There is still much construction to be done and a number of mining and metallurgical problems remain to be solved and tested in actual operation. Barring unforeseen interruptions, full conversion to underground mining should be completed in 1953.

When the present undertaking is completed, INCO will be able to hoist 13,000,000 tons annually, and the size of its underground mining operation will surpass that of any other non-ferrous base metal mining operation in the world.

This underground expansion is being completed by INCO without interrupting current production of nickel, which is at maximum capacity.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

. . made from quick-flash coal!

FIGURES FROM BUREAU OF MINES, DEPT. OF INTERIOR OF THE U. S.
(Moisture Free)

PROXIMATE ANALYSIS

Volatile Matter	38.9%
Fixed Carbon	57.4%
Ash	3.7%
	100.0%

ULTIMATE ANALYSIS

Hydrogen	5.4%
Carbon	82.0%
Nitrogen	1.6%
Oxygen	6.6%
Sulphur	.7%
Ash	3.7%
	100.0%

Fusion Point of Ash 2980° F

CROWN HILL SEACOAL FACING

CROWN HILL excels as a facing material because it is made from top quality, quick-flash coal . . . carefully pulverized and graded to match sand grain size, for maximum effectiveness. Foundrymen everywhere prefer CROWN HILL because its quick combustibility induces faster escape of gas and steam . . . produces a better finish . . . slashes cleaning costs. Your foundry, too, can use CROWN HILL to good advantage. Why not order a supply today?

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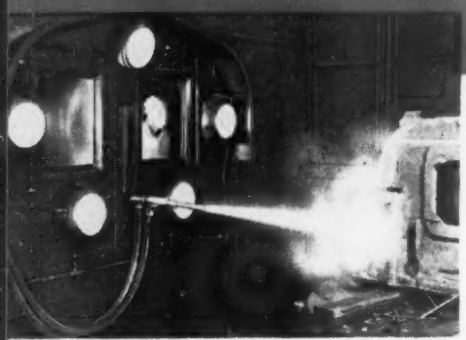
50-POUND CASTINGS and larger are easily handled by one man in a Pangborn Hydro-Sand Blast Room.

Get Pangborn Hydro-Sand Blast for

HIGH SPEED BLAST CLEANING AND CORE REMOVAL



TO speed cleaning, both core removal and blast cleaning are combined *in one operation* by Pangborn Hydro-Sand Blast. Only one operator is needed, and both the blast stream (sand and water) and rotation of the table are controlled from outside the room.

Water keeps windows clean of dirt and grime. There's plenty of brilliant illumination from spotlights aimed at the work. Swing-back ceilings and wide, seal-tight door prevent escape of dust and dirt. And core sand is recovered and core rods reclaimed without sledge damage.

Pangborn Hydro-Sand Blast saves you time and money by reducing cleaning time. You save on labor too, because subsequent roughing and chipping operations are faster and easier to perform.

WRITE FOR BULLETIN 1100. Contains full details and specifications on Hydro-Sand Blast Rooms. Address: Pangborn Corp., 1400 Pangborn Blvd., Hagerstown, Md.

Pangborn

BLAST CLEANS CHEAPER

with the right equipment for every job

ADVERTISEMENT

If you haven't heard it . . . IT'S NEWS!

IT'S ALL RIGHT to hold a conversation but you should let go of it now and then.

* * *

A SENSE OF HUMOR is what makes you laugh at something which would make you mad if it happened to you.

* * *

FUNNY HOW IT WORKS: You can send a message around the world in a seventh of a second, but it sometimes takes years to force a simple idea through a quarter inch of human skull.

* * *

AFTER SPENDING HALF of last summer's vacation trying to be a handy man around the house, we decided the old saying should be changed to read: "If you want a thing well done *don't* do it yourself unless you know how."

* * *

KNOW-HOW, incidentally, is mighty important. Our whole business here at Pangborn is founded on know-how. There was a time when industries improvised their own blast cleaning and dust control methods. Now they leave this sort of thing to Pangborn because they found out that Pangborn know-how can do it better and save them money. Have you any problems we can help you with?

* * *

OPPORTUNITY often looks so much like hard work that most people never recognize it.

* * *

EAT, DRINK AND BE MERRY for tomorrow there will probably be a new price hike.

* * *

IN THE MIDDLE AGES, the atom was a unit of time—about 15/94ths of a second. Maybe we should have left it that way.

* * *

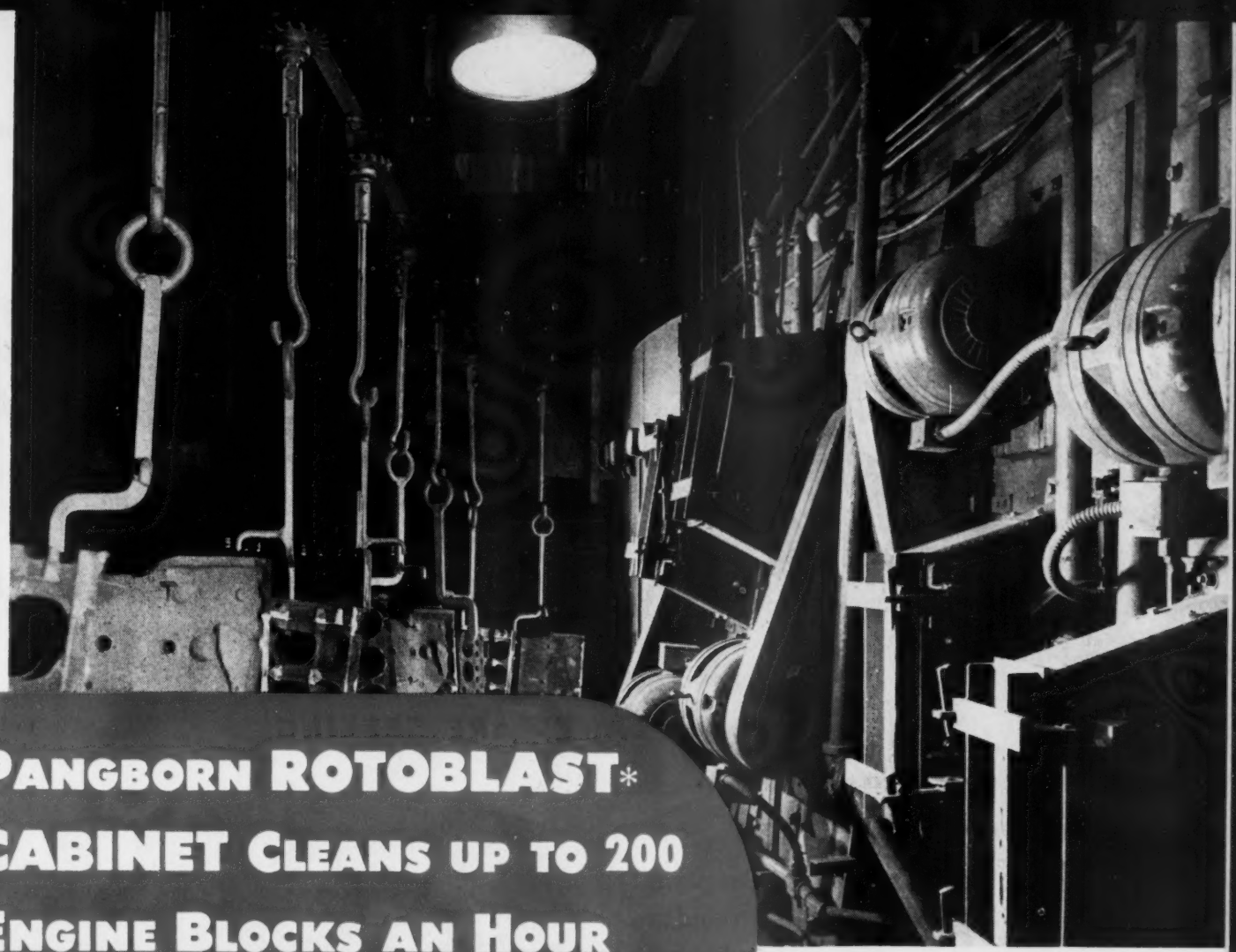
THE LATEST WRINKLE in television is a gadget to "provide appropriate scents" to accompany the picture and sound. They say it's brand new —but having detected an unpleasant aroma emanating from our set on certain occasions, we have some reason to suspect it is not.

* * *

MONEY STILL TALKS but a $5 bill doesn't speak with the authority it used to.

* * *

NOBODY KNOWS the exact age of the human race but all of us agree it's old enough to know better.



PANGBORN ROTOBLAST* CABINET CLEANS UP TO 200 ENGINE BLOCKS AN HOUR

at world's largest independent jobbing foundry

ABOVE: This rear view of Campbell, Wyant, Cannon's Pangborn "ES" ROTOBLAST Cabinet shows the conveyor system and four ROTOBLAST Machines. Inside the cabinet, the conveyor stops in front of each ROTOBLAST unit and slowly revolves the casting in the blast stream to assure complete cleaning.

Loading the heavy cylinder blocks on the conveyor is easily handled by two men.

BLAST CLEANING at Campbell, Wyant, Cannon Foundry Co., of Muskegon, Mich., is fast, efficient and *mechanized!* And the secret of this performance is two Pangborn "ES" ROTOBLAST Cabinets like that shown above. Heavy engine blocks can be cleaned at a rate of *200 an hour* . . . and cleaning is automatic! The result is faster, better, cheaper blast cleaning than ever experienced with other equipment.

Campbell, Wyant, Cannon started to mechanize their cleaning operation in 1937 . . . when they installed one of the first Pangborn monorail ROTOBLAST Cabinets. Later they installed a second Cabinet to meet production demands. As a result cleaning costs have been even further reduced, and there's no cleaning room bottleneck. Cleaning is a simple, automatic operation with high-quality work assured.

GET THE COMPLETE ROTOBLAST STORY: Bulletin 214 is informative and covers many applications. Write for your free copy to: Pangborn Corporation, 1400 Pangborn Blvd., Hagerstown, Md.

ROTOBLAST . . .

SAVES LABOR with push-button operation

SAVES SPACE because machines are compact

SAVES TIME by cleaning more loads per day

SAVES POWER since no compressor is needed

SAVES TOOLS because all scale is removed

MEMBER FEMA

Look to Pangborn for the latest developments in Blast Cleaning and Dust Control equipment.

Pangborn

BLAST CLEANS CHEAPER

with the right equipment for every job

MAKE 'EM BETTER—QUICKER—CHEAPER!

IN OTHER WORDS—

"Champion ize YOUR FOUNDRY

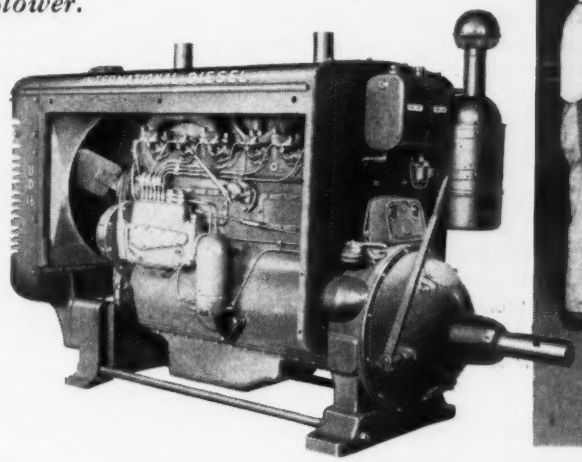
FOR THE RESULTS OTHER PROGRESSIVE PLANTS ARE GETTING

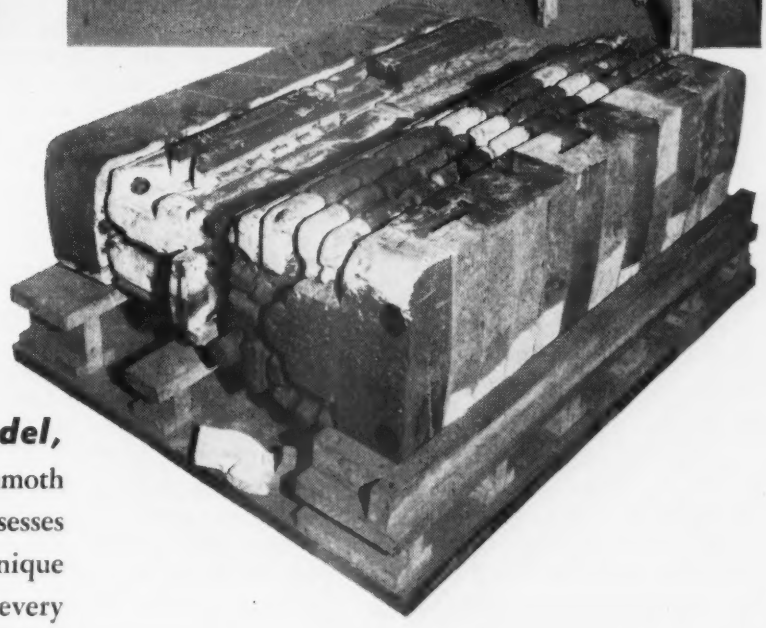
"Big or small...

you can blow 'em all—on Champions" —is no idle boast. Leading foundries such as represented in this advertisement are daily proving that you can blow 'em faster, at less cost, with more uniform quality and precision with Champions!

Operating a Champion CB-10 core blower is an easy, pleasant and safe occupation for this girl. Cores are used in brass castings for high grade plumbing fixtures. Photos courtesy Federal-Huber Company.

The largest Champion core blower, a CB-400, at work in the Milwaukee foundry of International Harvester Company producing cores for Diesel engine castings. The actual work of operating the control valves on this machine is no greater than that required on the smallest Champion Core Blower.





From the newest, smallest model, the "Junior" Champion, up to the Mammoth CB-400, every Champion Core Blower possesses the same distinctive features, the same unique blow valve, which assure a perfect core every time, in a fraction of a second, with the standard air pressure of 85 pounds. Operation is safe, simple, speedy! There's a size and type for every job.

Talk with us about your core requirements . . . you'll find it pays!

CHAMPION FOUNDRY AND MACHINE COMPANY

SALES OFFICE: 1553 W. MADISON ST. CHICAGO 7, ILLINOIS

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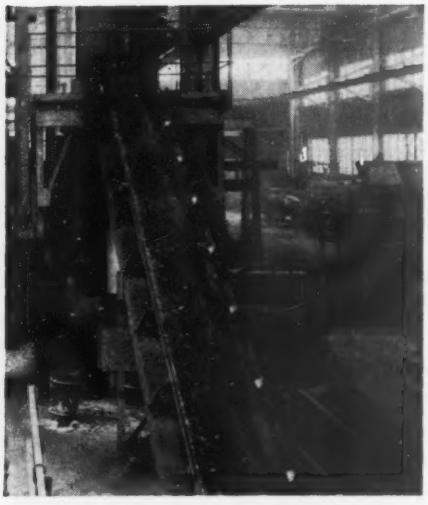
Sahara Belt handles hot sand... at lowest cost



■ One of the largest Pennsylvania steel foundries recently installed 135′ of 8-ply, 30″ Standard SAHARA belting on this conveyor handling hot foundry sand after shakeout. Because Imperial's SAHARA is specifically designed for continuous service under high heat conditions, it has been used by foundries for over 25 years.

Made for High Heat Service

SAHARA belting is made of tight woven, 37½ ounce, silver duck with a tensile strength exceeding 700 lbs. per inch of width. Fibers are impregnated with special heat-resisting compounds, the result of Imperial's 40 years' belt manufacturing experience. Exclusive Imperial double-stitched, Inner-Locked construction positively prevents ply separation.

Standard SAHARA Belting is recommended for continuous service to 300°; *Insulated* SAHARA from 300° to 450°; *Super Insulated* SAHARA from 450° to 600°.

Write for Data Sheets—and prices.

IMPERIAL BELTING CO.

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Imperial
INNER-LOCKED
BELTING

Engineered Belting—
The Right Belt for Each Job

With the EDITORS

IDEAS FOR FOUNDRYMEN: We introduce an old feature in a new dress this month as our traditional Helpful Literature insert becomes IDEAS FOR FOUNDRYMEN. Thanks to the co-operation of several score foundry suppliers, we have assembled a fine array of literature on equipment and supplies which is available on request to readers of FOUNDRY. Jack Lathrop unloosed his facile pen and gives you a quick picture of this month's offerings of "idea-stuff." (We have included several reprints of editorial articles also available.) Complete with two handy business reply postal cards for sending us your requests, the IDEAS insert may be found on pages 211-212.

—o—

Interview: During the recent regional conference in Birmingham, several visitors, including the editor, were interviewed by an enterprising reporter from the *Birmingham Post-Herald*. It turned out that this young man was Byron W. Riggan, son of Fred B. Riggan, foundry manager and superintendent, Key Co., East St. Louis, Ill., and at one time a resident of Birmingham. The morning paper carried Byron's story and the photograph reproduced below through courtesy of the *Post-Herald*. Fred should be proud of the boy and the work he is doing.

—o—

Blackout: If any of our Wisconsin friends are wondering why we did not include photographs with our report in the April issue on the Wisconsin Regional Foundry Conference, the answer is that the omission was not intentional. During the conference the Wisconsin Chapter's capable photographer, Walter Napp of Badger Firebrick & Supply Co., was busy with his camera. Came the following week and Walter sadly reported that, on developing his thirty pictures, he had nothing but "the nicest blobs of electric lights on the film that you have ever laid your eyes on." It seems that his camera was out of synchronization.

—o—

Cover: Some weeks ago Editorial Art Director Don Cadot and the editor visited the plant of Eastman Kodak Co., Rochester, N. Y., to see a demonstration of the Kodak Flexachrome process, which is defined as "a method of making prints and transparencies in full color from black-and-white or color originals by applying dyes of various colors to a gelatin relief image." To try out this development in a rather simple form, a second color was added to a photograph taken in the metallurgical laboratory of Eastman. The cover illustration of this issue is the interesting result.

—o—

Happiness: In this day of constantly mounting pressures resulting from an abundance of orders clashing with critical shortages of both men and materials, it seems difficult to find pleasure and happiness in the daily tasks of producing castings. Perhaps J. A. Rumgay, vice president, Bow-

(*Concluded on page* 12)

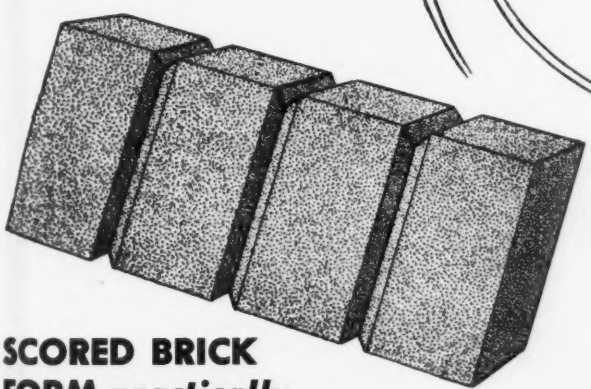
Left to right—L. A. Danse, General Motors Corp., Detroit; Charles K. Donoho and Dr. James T. MacKenzie of American Cast Iron Pipe Co., Birmingham, and the editor discussing the future possibilities of automatic production control in the foundry industry

Don't Swear at Your Castings, Swear by Them!

POUR Clean, MORE FLUID IRON FOR BETTER CASTINGS

PRIDE IN PRODUCT AND NEED OF BETTER PROFIT HAS MADE LEADING FOUNDRIES REGULAR USERS OF—

Famous CORNELL CUPOLA FLUX



SCORED BRICK FORM *practically eliminates the labor in fluxing molten iron.*

Pre-Measured. All you do is toss Famous Cornell Cupola Flux into cupola with each ton charge of iron, or break off one to three briquettes (quarter sections) for smaller charges, as per instructions.

Whether you operate a gray iron foundry or a malleable foundry with cupola operation, Famous Cornell Cupola Flux will give your castings a better start with clean metal. It eliminates the cause of many casting rejects and increases your prestige with those who are fussy about quality and prompt deliveries.

Famous Cornell Cupola Flux does more than cleanse molten iron. It makes it hotter and more fluid, reduces sulphur and keeps slag fluid.

Famous Cornell Cupola Flux insures cleaner cupolas and greatly reduces maintenance.

WRITE FOR BULLETIN NO. 46-B

The CLEVELAND FLUX Co.
1026-1040 MAIN AVENUE, N. W.
CLEVELAND 13, OHIO
Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum Flux Since 1918

Famous CORNELL ALUMINUM FLUX

CLEANSES MOLTEN ALUMINUM so that you pour clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections can be poured. Castings take a higher polish. Exclusive Formula greatly reduces obnoxious gases, improves working conditions. Dross contains no metal after this flux is used.

FAMOUS CORNELL FLUXES
Trade Mark Registered

Famous CORNELL BRASS FLUX

CLEANSES MOLTEN BRASS even when dirtiest brass turnings or sweepings are used. You pour clean, strong castings which withstand high pressure tests and take a beautiful finish. The use of this flux saves you considerable tin and other metals, and keeps crucible and furnace linings cleaner, adds to lining life and reduces maintenance.

No production-line bottlenecks . . . and no hold-up in filling DO's since the grinding supervisor started using Simonds Abrasive Company wheels. No wonder he's pleased. You'll find plenty of satisfaction . . . and serviceability too . . . in these efficient production tools. Send now for free data book describing Simonds grinding wheels, mounted wheels and points, segments and abrasive grains . . . products proven in everyday industrial use . . . and backed by Simonds 50 years experience as a major grinding wheel manufacturer.

SIMONDS ABRASIVE CO.
grinding wheels

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON
DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

(*Concluded from page 10*)

manville Foundry Co. Ltd., Bowmanville, Ont., has found the solution to the problem in the following poem, entitled "Iron Men":

Oft we hear in song and story
How in those brave days of old;
Knights rode forth in shining armour
Pledged to "fight" or "foray" bold.

But in all these dashing stories
Where men's names have gained renown,
There are worthy knights of armour
With no records handed down.

Weak, indeed, the Knight on horseback,
Had he not been clad in mail;
And without his lance of iron
All his bravery would fail.

So the story I would tell you
Would be of those nameless men;
Working with their forge and hammers
Heedless of a poet's pen.

So it is today in battle,
So it is today in life;
Unseen men in many foundries
Help to win in every strife.

From the master in his office
To the molder on the floor,
Each is in the tide of battle
Just as in the days of yore.

So you men who work in iron,
Whether you "design" or "pour,"
Work together like true brothers
Don't be always getting "sore."

Each is valued—each is needed,
Like the good links in a chain,
For a man who is not loyal
Makes good work of others vain.

So if you be man or master
Do your work with all your might,
Be not twisting here and yonder
For some small imagined slight.

Sit ye down like men and brothers,
Boss and Workers—all are men,
Talk it over—quiet and friendly,
Ask each other—"Did ye ken?"

Let not evil forces use you,
Let not anger sway your mind,
Always think of Him who taught us
"To each other—be ye kind."

Keep the cupola aroaring,
Mold and pour—shake out and grind.
Manly work for honest wages,
There true happiness you'll find.

—o—

Tell Us About It: The Business Staff has really been in our hair the past few weeks—gathering recent photographs of the complete editorial staff. They finally succeeded in collecting 21 out of the 23 which comprise our staff and soon, no doubt, you'll be seeing us in print. We'd rather see YOU in print. The next time you fall off a stepladder, catch a 5-lb bass or are made assistant-to-the-president, DO tell us about it and send us your picture. Please!

F. G. S.

HERE'S THE ANSWER TO YOUR MANPOWER PROBLEMS

The NEW REDDY SANDY with Vibrating SHAKEOUT and SCREEN performs all these operations without shoveling

Stationary Shake-Out grate can be furnished if desired.

- Shake-out
- Screening
- Magnetic separation (optional)
- Automatic tempering
- Aerating

It is no longer necessary to handle and rehandle the sand during shake-out and sand conditioning. Now, without shoveling of any type, the new Reddy Sandy separates the sand from castings and cores and prepares it for the molder.

All you have to do is dump the mold on the vibrating shake-out deck of the Reddy Sandy and pick off the castings. The vibrating screen under the shake-out deck screens the sand and removes tramp iron and core butts. A magnetic separator (optional) removes smaller metal particles and an automatic tempering device uniformly adds water. As the sand is discharged from the Reddy Sandy, a built-in aerator blends in the water, fluffs the sand and cools it.

If Reddy Sandy is used with a Handy Sandy to give the molder overhead sand, the sand never has to touch the floor from the time the flask is dumped until the molder opens the hopper to drop sand into the flask.

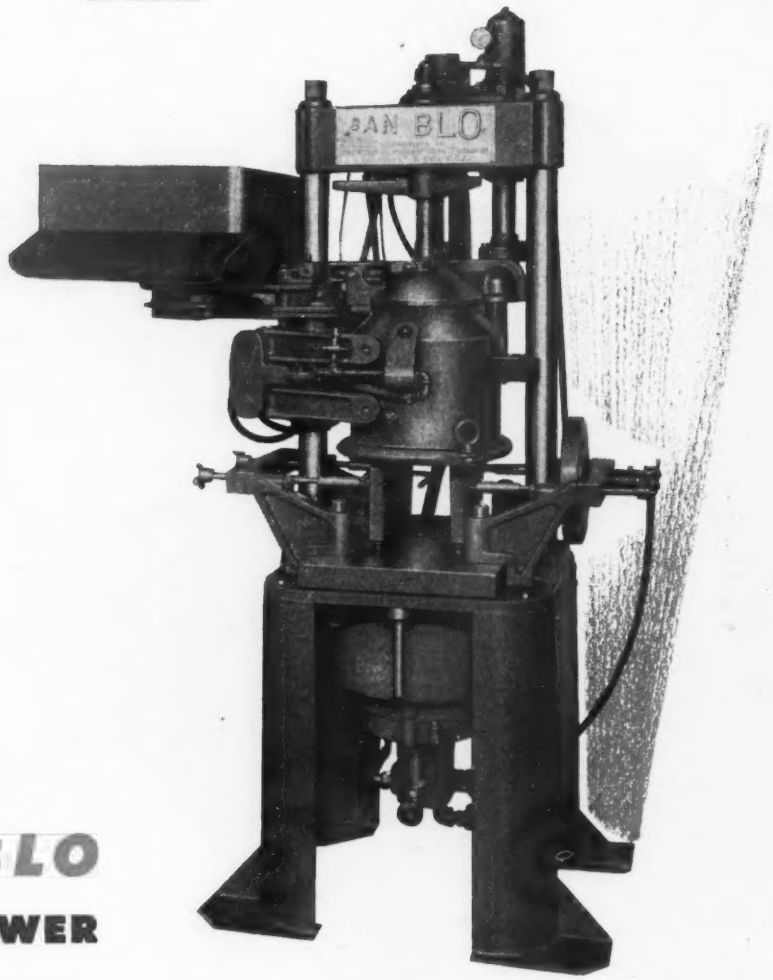
Why waste time, manpower and money handling sand again and again when Reddy Sandy combines all shake-out and sand conditioning operations in one unit to eliminate intermediate handling. *Send today for full details.*

NEWAYGO | **ENGINEERING COMPANY**

NEWAYGO, MICHIGAN

Manufacturers of Neway Mold Handling, Sand Handling and Conditioning Equipment

. . . blows all core mixtures!



SAN-BLO
CORE BLOWER

Iron, steel and non-ferrous foundries are boosting production and slashing core room costs with the new, all-purpose SAN-BLO. They're blowing cores and sand mixtures always rammed before . . . blowing sand with higher green strength and moisture content than ever before possible . . . eliminating core rods and driers in many cases. Foundries, large and small, are finding new economies in SAN-BLO. Why not investigate? Send for bulletin CB-2, today.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

The FEDERAL F N
4600 EAST REET
CHICAGO • DETROIT • MILWAUKEE W YOR

. . . small in size—big producer!

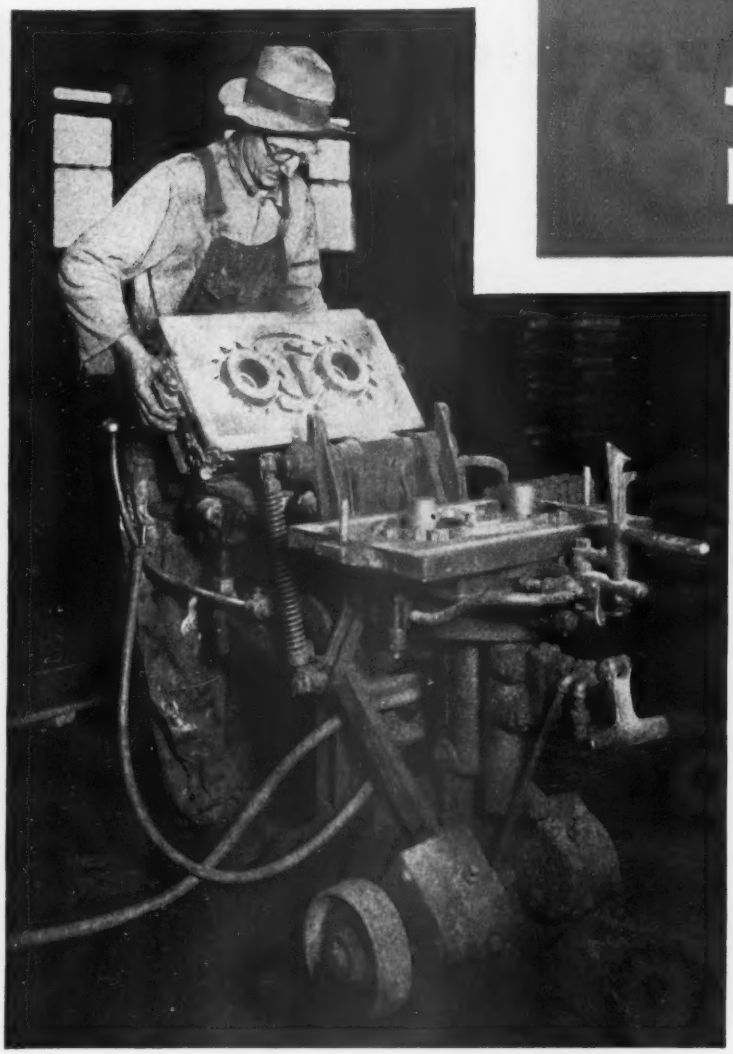
WHIRLMIX
SAND MIXER

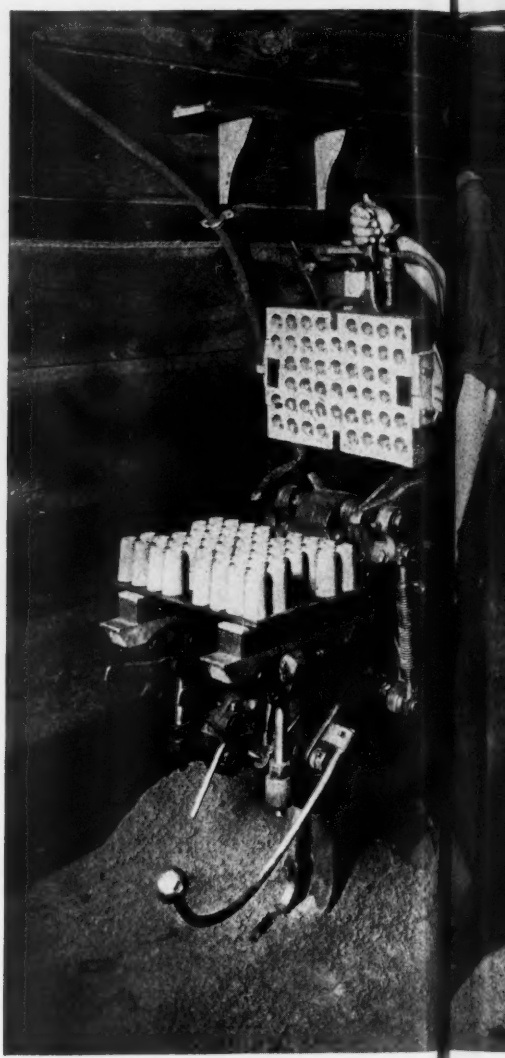
There's economy in the new WHIRLMIX. It packs a lot of production in small size . . . mixes up to 4,000 lbs. per hour . . . at lowest cost. Batch size is 3 cubic feet, yet WHIRLMIX weighs but 1,060 lbs. Easily moved and doesn't require a foundation. Two flexible, spring steel arms mix sand quickly and thoroughly, without overheating or crushing sand grains. Reasonably priced and available for immediate delivery. Write today for 4-page bulletin.

NDRY SUPPLY *Company*
EET • CLEVELAND 5, OHIO
W YORK • CHATTANOOGA • RICHMOND, VA. • LOS ANGELES

INTERNATIONAL TYPE RJ

Jolt Ram · Ha
Hand or Foo





TYPE RJ — Jolt Ram, Hand Turnover, Hand or Foot lever Draw Machine, is built in a wide range of sizes from 14" x 8" draw up to 20" x 12" draw.

The overall construction and design of the International RJ makes for convenient operation.

THE RJ MACHINE IS JUST ONE OF THE 90 STANDARD TY ND

INTERNATIONAL MOLD G

LA GRANGE K,

RJ MOLDING MACHINE

Hd Turnover
oLever Draw

- Inquiries should specify outside width and length of the largest flask or core box to be handled and amount of draw required.
- The International **TYPE RJ** is designed, as are all of the machines in the line, by experienced foundry engineers who have a practical working knowledge of the problems of the business.
- The RJ is used extensively for cores.

TY ND 1400 DIFFERENT SIZES IN THE INTERNATIONAL LINE

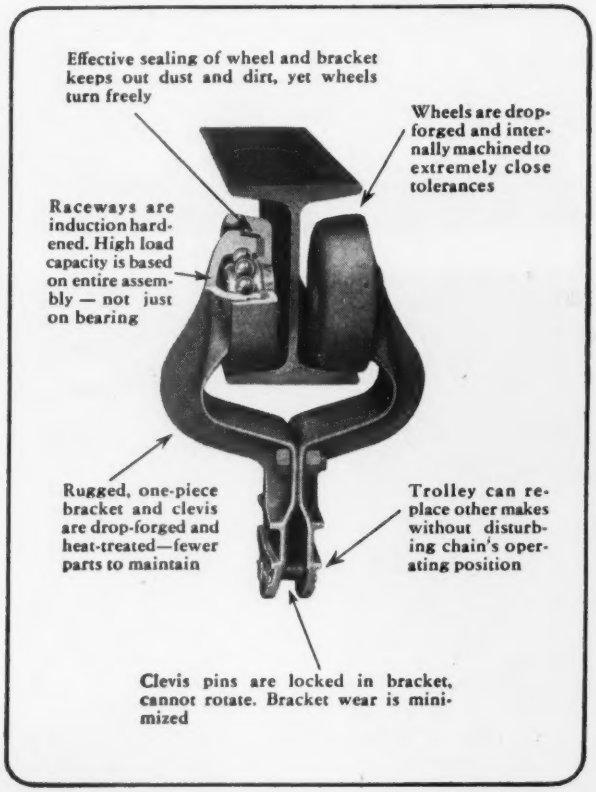
D G MACHINE COMPANY

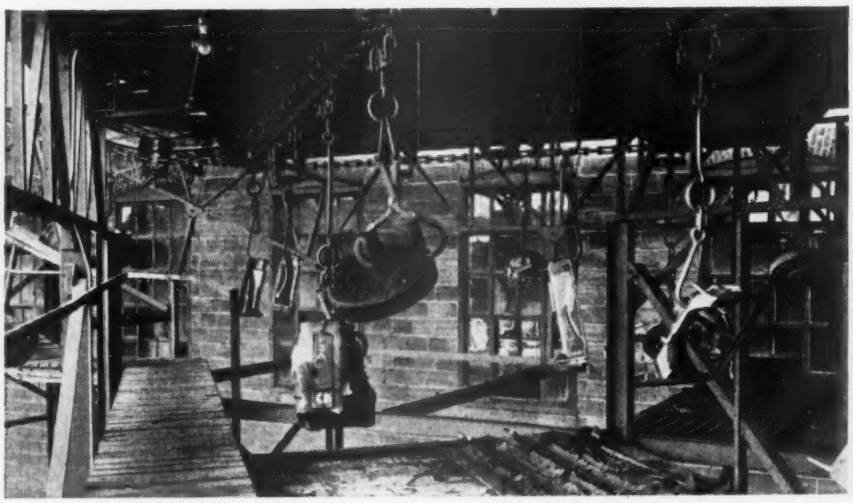
E K, ILLINOIS

When you buy TROLLEY CONVEYORS . . .

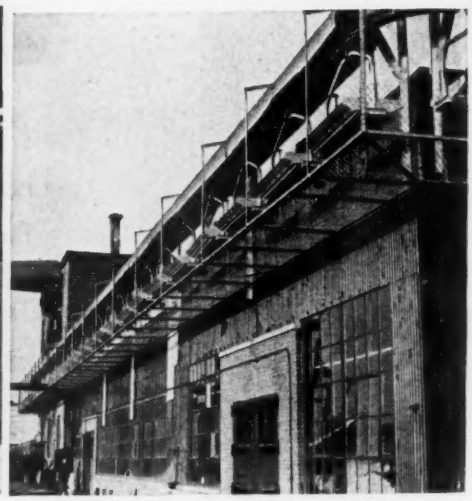
LINK-BELT GIVES YOU BOTH!

Superior components plus engineering ingenuity


Effective sealing of wheel and bracket keeps out dust and dirt, yet wheels turn freely
Wheels are drop-forged and internally machined to extremely close tolerances
Raceways are induction hardened. High load capacity is based on entire assembly — not just on bearing
Rugged, one-piece bracket and clevis are drop-forged and heat-treated—fewer parts to maintain
Trolley can replace other makes without disturbing chain's operating position
Clevis pins are locked in bracket, cannot rotate. Bracket wear is minimized



Section of a Link-Belt Trolley Conveyor in a steel gallery outside a large foundry upon which castings travel in order to cool properly. 1½ hours are required to complete this cooling circuit.



Smaller castings cool in pans carried by the Trolley Conveyor around this foundry building.

TRAVEL up, down and around at synchronized speeds. Straight-line production from shake-out to shipping, regardless of physical layout. Saving of floor space. Release of manpower for productive jobs.

You get all these outstanding production advantages with any well-engineered overhead trolley conveyor. But you get more—much more—when you specify Link-Belt!

Not only does Link-Belt make the most popular, the most advanced trolley on the market—you also tap industry's greatest source of materials handling and power transmission experience.

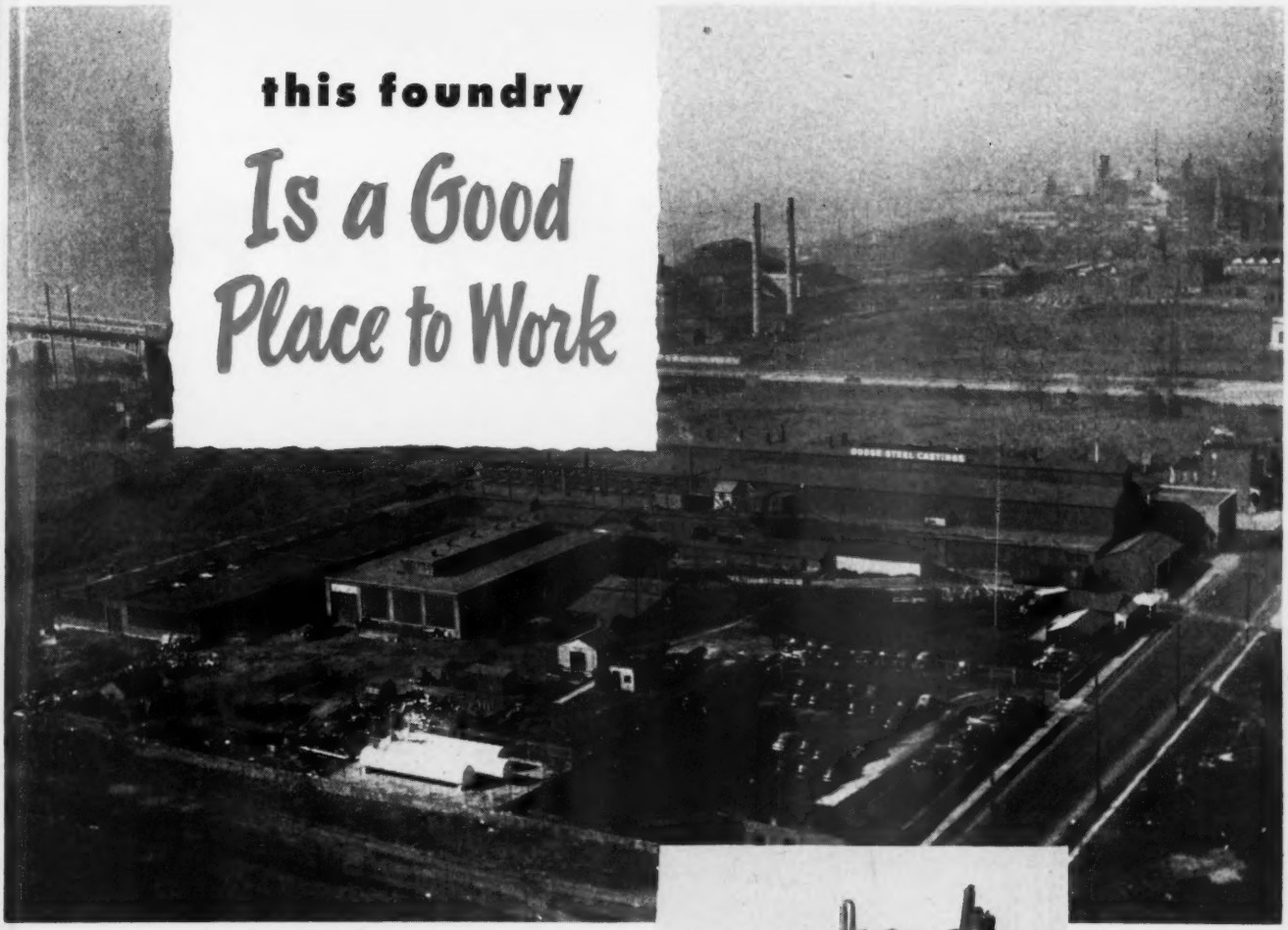
Put quality products plus engineering ingenuity to work for you. Our specialists will work with you and your consultants . . . help you set up smooth, steady, straight-line production in your plant.

LINK-BELT

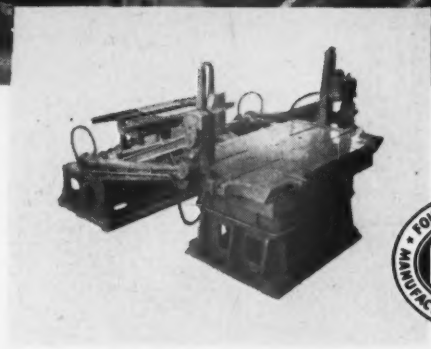
OVERHEAD TROLLEY CONVEYORS

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities. 12.409

this foundry
Is a Good Place to Work



Dodge Steel Co., Philadelphia



THIS electric steel foundry occupies approximately 6 acres of ground in a suburb of Philadelphia, and specializes in production of pressure castings, complex castings and machine parts, and transport castings.

Diversified facilities are best indicated by the range of castings, from one to 500 lbs., which the foundry is capable of producing at a rate of about 475 tons per month.

Evidence that it is a good place to work exists in its concentration on soundness and accuracy of production. This emphasis, coupled with modern techniques and equipment, has been a byword for over 30 years. It is a clean, well-lighted plant.

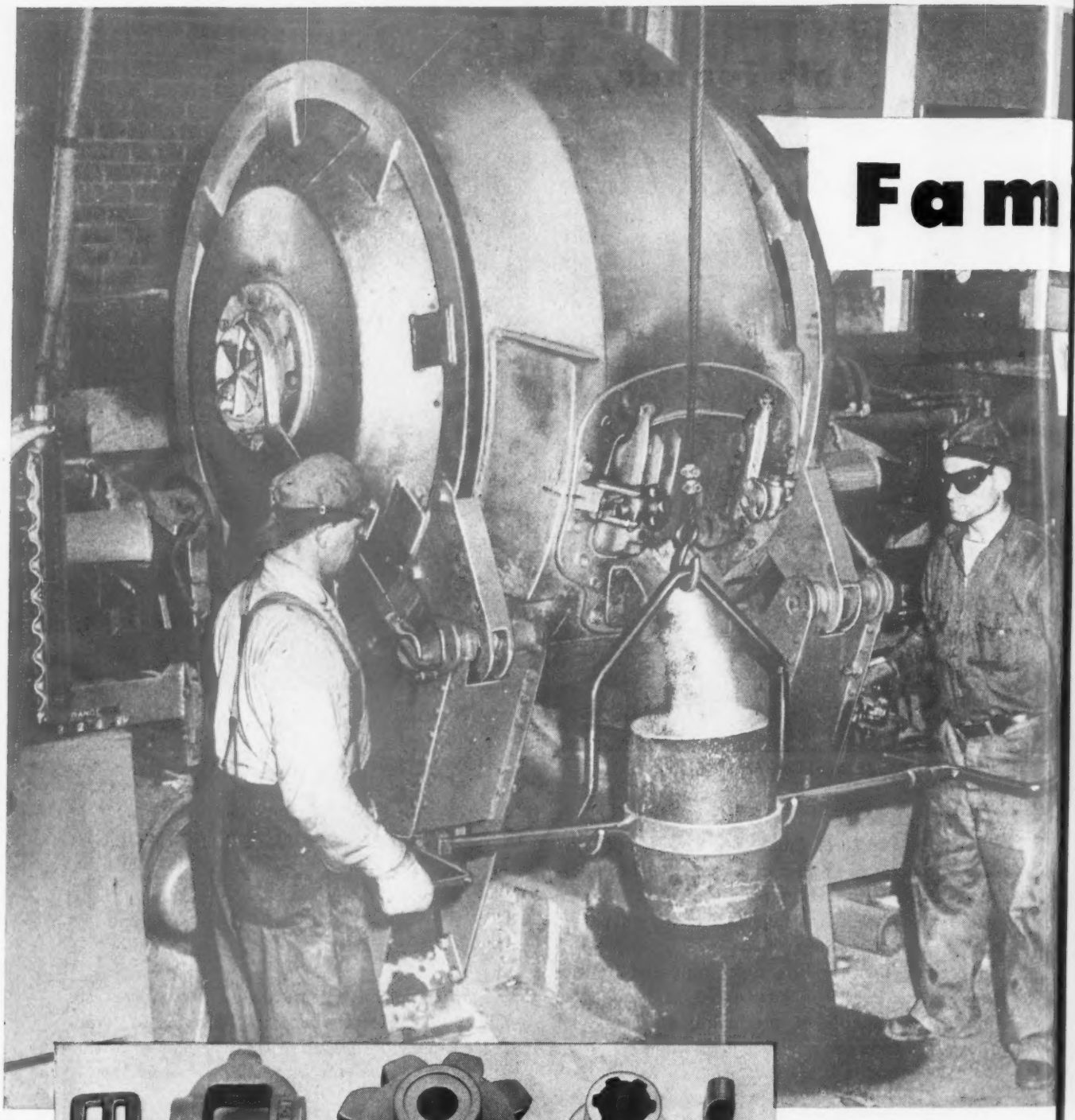
Dodge has an active personnel relations program with safety and good housekeeping high on its list. It is equipped to make every type of soundness, mechanical, chemical and structure test. The 3000 lb. Herman Molding Machine illustrated contributes to Dodge quality and quantity production. It is one of several types in use at this plant.

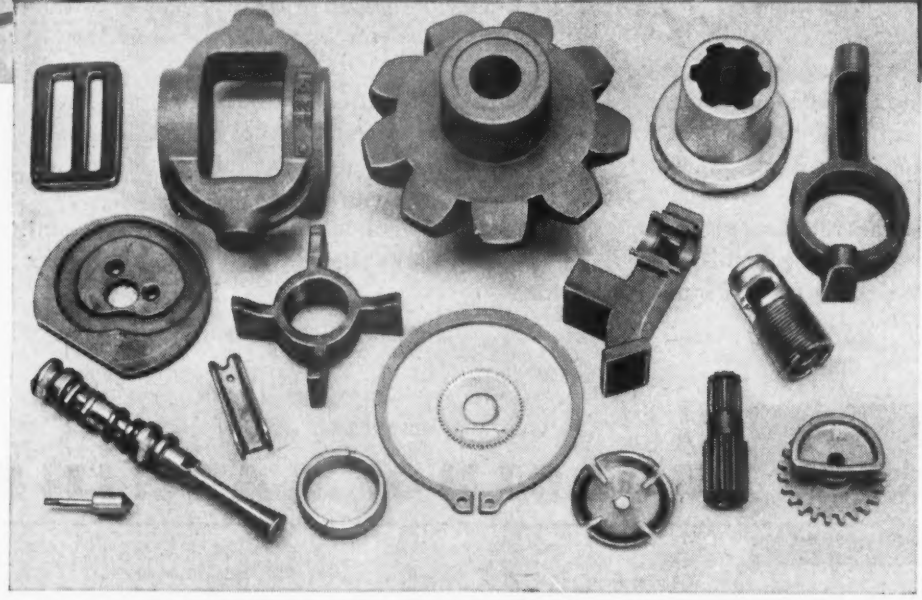
Less than one minute is required to jarr, roll-over and draw pattern. Turnover plate is equipped with vibrators having an automatic starting device.

Best feature of all is that Hermans here, and everywhere, make their way by the way they're made.

Herman MOLDING MACHINES

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH, PA.





▲ Tapping a heat of beryllium copper from one of five Detroit Electric Furnaces at The Beryllium Corp.

◀ Representative castings of beryllium copper, produced at The Beryllium Corporation.

y of Eight!

The Beryllium Corporation melts all of its beryllium copper alloys in Detroit ROCKING electric furnaces

Beryllium copper alloys, produced by The Beryllium Corporation, are gaining an expanding place in industrial usage because of their special combinations of useful properties. All eight alloys in Beryllium Corporation's family are melted in Detroit Rocking Electric Furnaces.

Accurate Control

Accurate temperature control is one of the important advantages these furnaces deliver. Through melt after melt, the desired melting cycle is followed, resulting in fastest, most efficient operation.

The rocking action of the furnace during the melt always assures homogeneity. Minimum metal loss allows a high degree of control over alloy composition.

Metal for castings is poured directly from the furnace into pig molds of various sizes. Detroit Rocking Electric Furnaces are also used for producing ingots, too.

Favorites in many Foundries

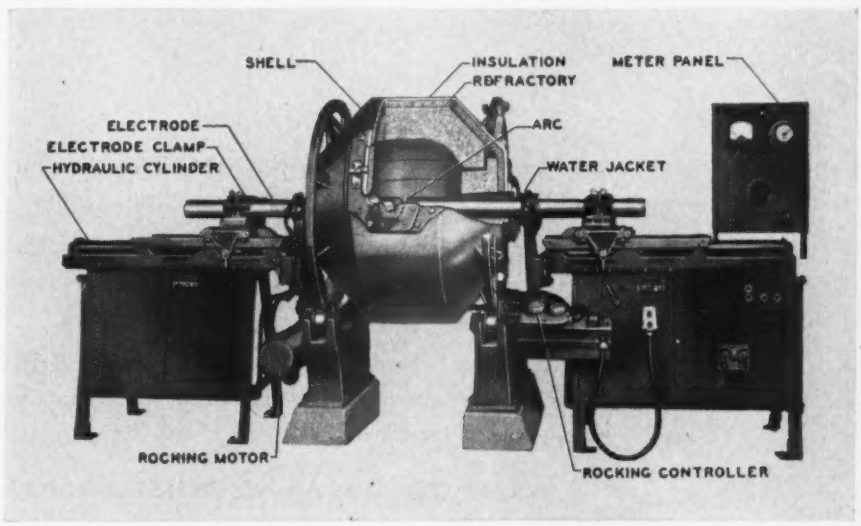
The same qualities which make them so efficient at Beryllium Corporation work as well at hundreds of foundries throughout the world.

Positive control of composition and quality, reduced metal shrinkage, more efficient use of power, no carbon pick-up because electrodes remain clear of the molten metal, more heats per day, higher quality castings, fewer rejected castings, more usable metal per melt, less out-of-production time because of easy shell replacement—these are some of the advantages Detroit Electric Furnaces offer in ferrous and non-ferrous melting.

Furnaces (10 to 4000 lbs. capacity) are individually designed to meet your plant electrical specifications.

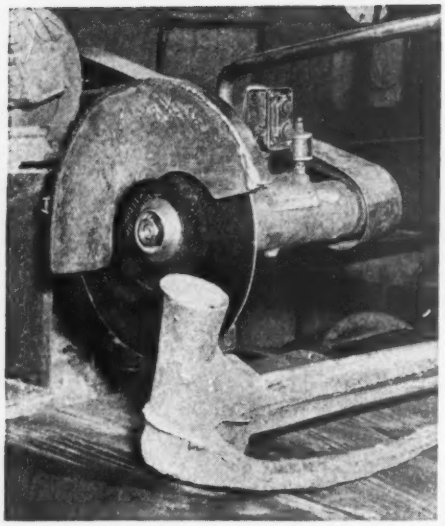
Write for Facts

Send us your production data. Ask for facts on high operating economy, quality control and other advantages for *you* in Detroit Rocking Electric Furnaces!



ELECTRIC FURNACE DIVISION

Kuhlman Electric Company • Bay City, Michigan



REINFORCED CUT-OFF WHEELS

FASTER CUTTING
GREATER SAFETY

MANHATTAN ABRASIVE WHEELS

PORTABLE WHEELS

MORE METAL REMOVED PER MAN-HOUR

The greatly increased strength of MANHATTAN Reinforced Foundry Cut-off Wheels enables them to withstand the severe strains imposed by foundry cutting.

With his greater confidence in the safety of these wheels, the operator works more vigorously instead of "babying" the wheel. This results in higher production and lower costs.

Manhattan Abrasive Wheels for portable grinders are engineered for the job. They satisfy workers on incentive pay who want high grinding speeds. They satisfy management men who want good quality production and lower costs.

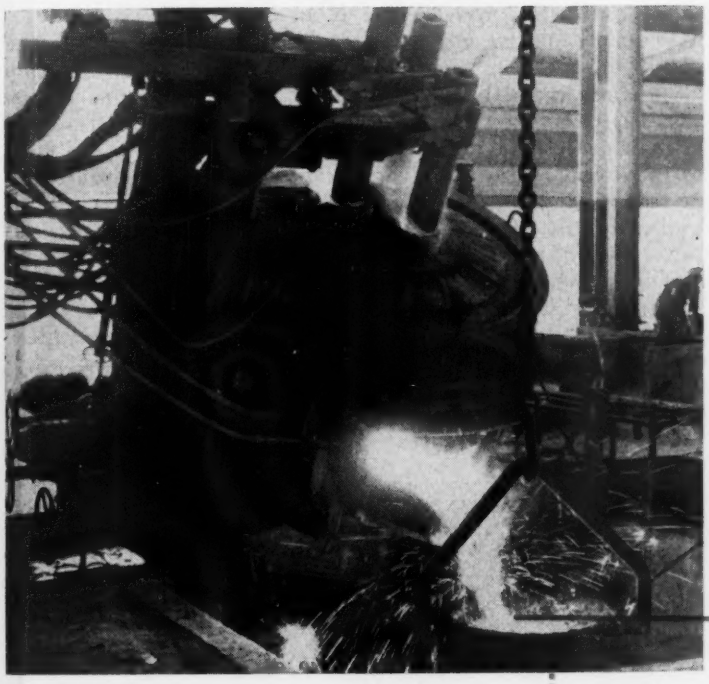
WRITE TO ABRASIVE WHEEL DEPARTMENT

MANHATTAN RUBBER DIVISION
RAYBESTOS-MANHATTAN, INC.
PASSAIC, N. J.

Manufacturers of Mechanical Rubber Products • Rubber Covered Equipment • Radiator Hose • Fan Belts • Brake Linings • Brake Blocks • Clutch Facings • Packings • Asbestos Textiles • Powdered Metal Products • Abrasive & Diamond Wheels • Bowling Balls

to keep electric furnace operation profitable

keep IRONTON CARO-LINE handy for bottom and sidewall linings...



Demand will be pushing capacity from now on, and your operating schedules will allow less time for relining acid electric furnaces. That may be a good thing . . . if you rely on *Ironton* CARO-LINE for rammed-in bottoms and sidewalls. The monolithic lining can make a big saving in cost of labor to install, in longer service, and in better quality of metal poured.

Ironton CARO-LINE is a highly siliceous refractory material blended with ceramic minerals to give it uniform bonding qualities. At today's high temperatures, it shows practically no volume change. CARO-LINE will not spall; a lining of this "Reliable Refractory" lasts longer than silica brick.

Ironton CARO-LINE is shipped dry in 100 pound bags. It is fine-grained, easily mixed with water and ganister to make a smooth-working ramming material.

IN LADLES, TOO you will find CARO-LINE gives longer service and protects the metal from slag inclusions. One material . . . Ironton CARO-LINE . . . will take care of all your ladle-lining problems in malleable iron, alloy iron, or electric furnace steel operations. Ironton representatives will supervise the first installation of linings in hand, bull, or transfer ladles.

AROUND THE ELECTRODES of electric furnaces, another *Ironton* "Reliable Refractory" gives superior service. Use Air-setting NOJOINT for ramming in this critical section where spalling causes failure. The monolithic ring eliminates the need for special shapes. In this location, NOJOINT gives twice the service of silica roof brick.

phone for the facts

Baltimore, Maryland	MUlberry 7184
Boston, Mass.	HAncock 6-1210
Buffalo, N. Y.	TAylor 2091
Charlotte, N. C.	55-285
Chattanooga, Tenn.	7-6697
Chicago, Illinois	HArrison 7-8708
Cleveland, Ohio	CHerry 1-0711
Cleveland, Ohio	VUlcan 3-8200
Detroit, Michigan	WOodward 3-8123
Hartford, Conn.	33-0941
Ironton, Ohio	109
Jacksonville, Florida	3-5586
Milwaukee, Wisconsin	DAly 8-4790
Philadelphia, Pa.	JEfferson 5-1012
St. Paul, Minn.	EMerson 6312
Seattle, Washington	MAin 4330
Silver Spring, Md.	JUniper 7-5468
Spokane, Washington	MAin 1644

GOOD NEWS! Ironton is expanding facilities to supply refractories needed in the defense effort. This will mean an increase of 40% in brick products and 100% more NOJOINT. A highlight of Ironton's growing stature in the refractories industry, this capacity promises better service to all users of "Reliable Refractories".

RELIABLE REFRACTORIES

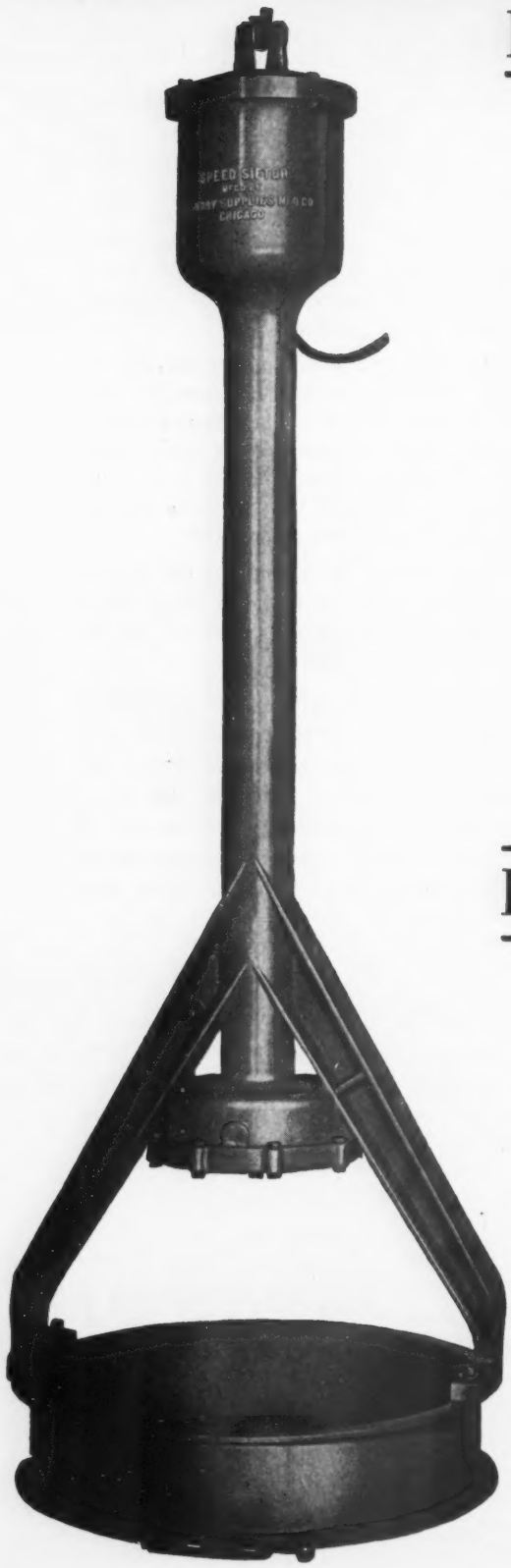
THE IRONTON FIRE BRICK COMPANY
IRONTON, OHIO

BERLITE • ALSET
CARO-LINE • NOJOINT • SPECIAL SHAPE REFRACTORIES
KENTUCKY CLAY FIRE BRICK PRODUCTS

Increase Production

with the

ROTOPLANE SPEED SIFTER ★ RED ELECTRIC VIBRATORS



ROTOPLANE SPEED SIFTER

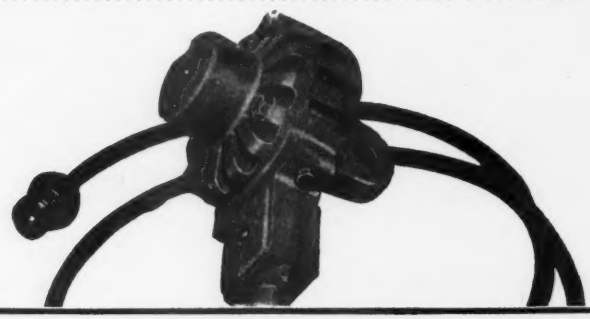
The ROTOPLANE Speed Sifter is an *improved* sand riddle of much greater capacity and much longer life. One size and type serves all purposes in the foundry—does *all* your sifting more quickly and economically.

It is easily handled by one man, weighs approx. 90 lbs. is 62 in. high overall. The one-piece frame of tough aluminum alloy makes for a remarkably effective vibration. Its smooth, free, rotary action vastly increases bearing life; all bearings grease packed. All mechanism of the ROTOPLANE is *completely* enclosed—no bearings or activating parts of any kind exposed to dust and grit.

The Quick-Change Sieves are instantly interchangeable, mounted in smooth, flat steel ferrule, with 20-inch diameter clear sifting area. No jagged edges to tear workers' hands, no storage problem.

$270.00 f.o.b. Chicago—complete with cable, safety ground wire. Standard 1/3 h.p. motor, 110 volt, 60 cycle, single phase and 220 volt, 3 phase motors $25.00 additional.

UNIVERSAL FREE - WHEELING RIDDLE equipped with motor as above $245.00



RED ELECTRIC VIBRATORS

True-to-pattern castings make satisfied customers . . . more repeat business. Increase your production and castings quality with RED Electric Vibrators. Sturdy, dustproof, lowest operating cost (electricity does not freeze). Unequaled for consistent year-'round results in foundries all over the world.

(All Prices f.o.b. Chicago)

No. 1—Light match plate work	$11.00
No. 2—Medium match plate work	13.00
No. 5—Heavy match plate, tub and bench work	17.00
No. 9—Machine and heavier work	26.80

Third (ground) wire per U. S. Govt. code—furnished with No. 9 at no extra cost; $1.20 extra with Nos. 1, 2 and 5 vibrators.

KNEE SWITCHES for operating Red Electric Vibrators: Single pole $5.00, Double pole $6.50.

FOUNDRY SUPPLIES MANUFACTURING CO.

2221 Orchard Street **Chicago, Illinois**

CABLE ADDRESS: "ROTOPLANE CHICAGO"

APEX

Z-50

ALUMINUM ALLOY

Your production line is your profit line—safeguard it by using APEX Z-50, a proven quality alloy. Having uniform casting characteristics with better-than-average mechanical properties, *and free machinability,* APEX Z-50 will meet most of your casting requirements. When quality plus economy is paramount, specify APEX Z-50—"Proved Best By Test"!

Apex Smelting Company

Chicago • Cleveland

2537 WEST TAYLOR STREET · CHICAGO 12, ILLINOIS
6700 GRANT AVENUE · CLEVELAND 5, OHIO

more production...less waste!

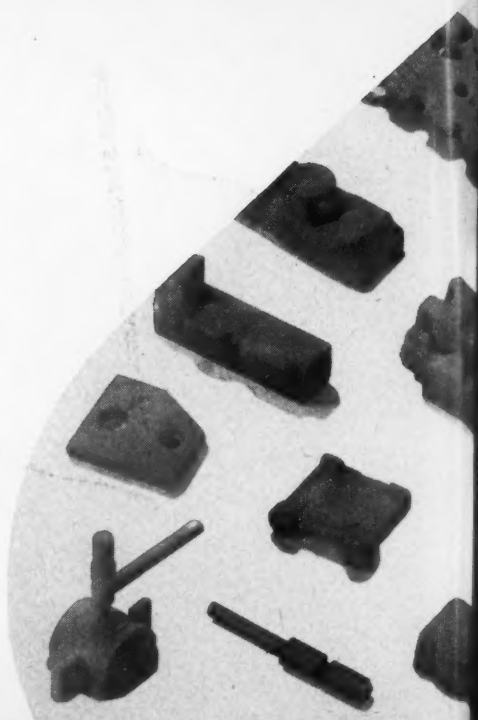
COLEMAN OVENS

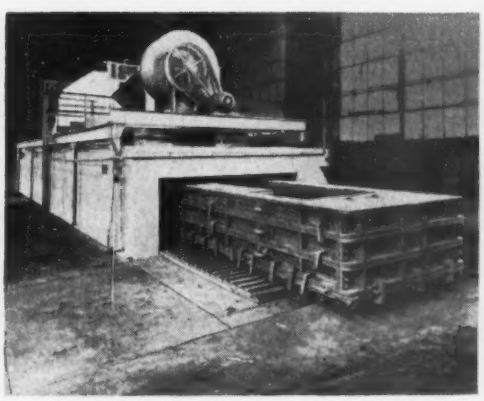
● **COLEMAN CONVEYOR OVENS** enable you to obtain more and better cores from your present manpower and floor space. Increased production of perfect cores and molds is essential to meet the ever growing demand for more, better quality castings.

Hundreds of foundries have found that Coleman Conveyor Core Ovens reduce baking time, improve working conditions, and make the most efficient use of skilled and unskilled labor by eliminating racks, trucks, and other time-wasting handling methods.

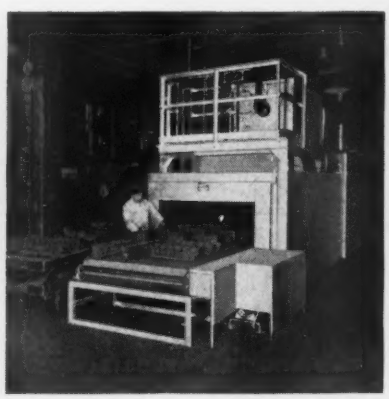
Coleman Conveyor Mold Ovens for high-speed drying at amazing savings in time, fuel and labor. Rapid turnover of flask equipment and lower cleaning costs are other advantages.

For increased production at lowest overall cost install Coleman Conveyor Ovens. There is a type for every purpose. Write for Bulletin 48 today.

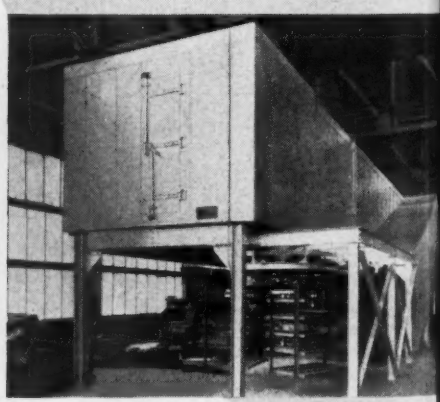




Coleman High Speed Continuous Mold Oven



Coleman Continuous Redry Oven



Coleman Horizontal Continuous Conveyor Co

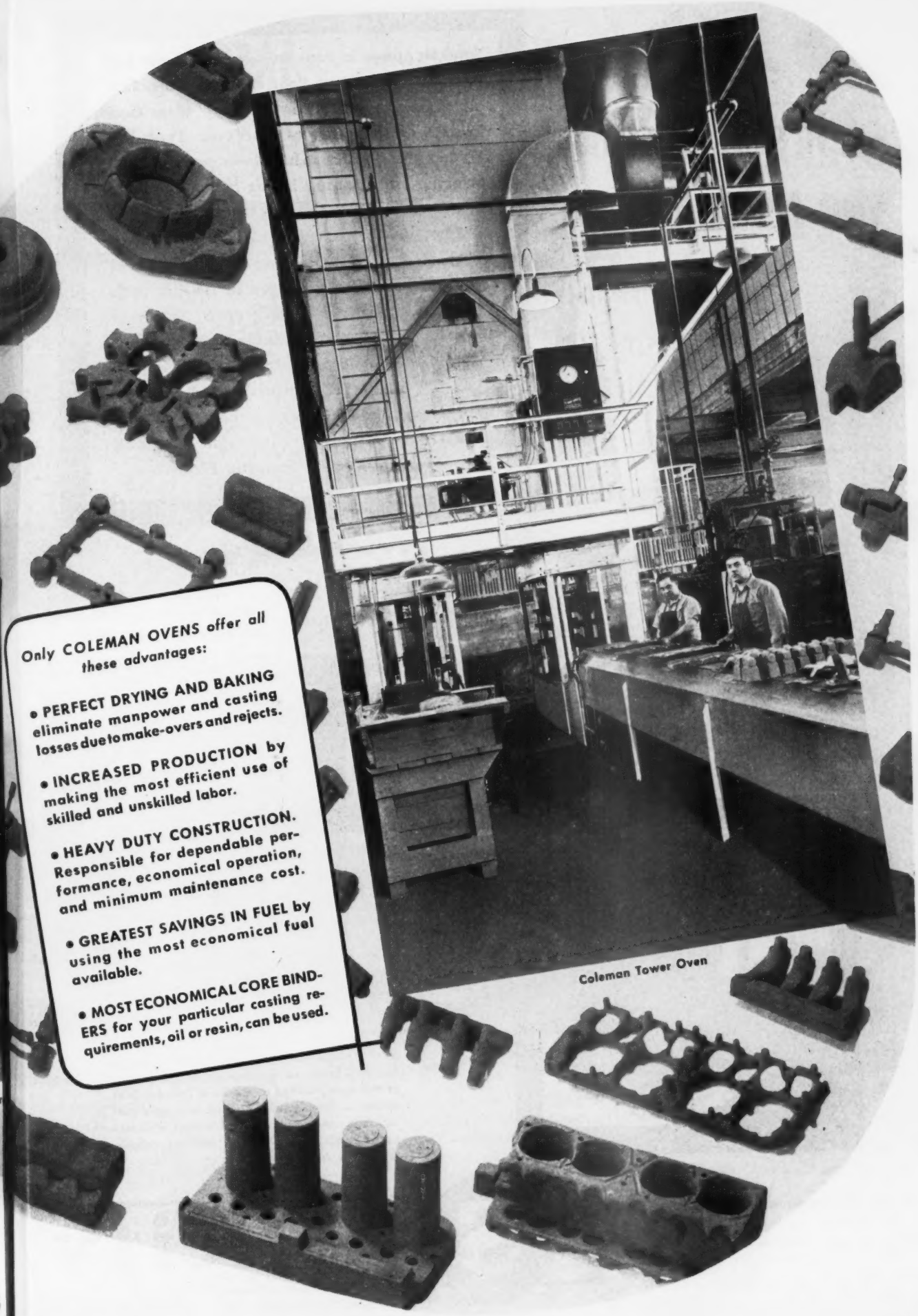
A COMPLETE RANGE OF TYPES: COLEMAN OVENS are built in a complete range of sizes and capacities for every core-baking and mold drying requirement: Tower Ovens, Horizontal Conveyor Ovens, Car-Type Ovens, Transrack Ovens, Rolling Drawer Ovens, Portable Core Ovens, Portable Mold Dryers, etc.

THE FOUNDRY EQUIPMENT COMPANY

1831 COLUMBUS ROAD — CLEVELAND 13, OHIO

MEMBER FEMA

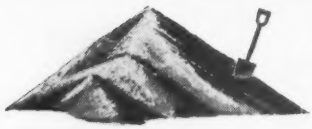
WORLD'S OLDEST AND LARGEST FOUNDRY OVEN SPECIALISTS



Only COLEMAN OVENS offer all these advantages:

- PERFECT DRYING AND BAKING eliminate manpower and casting losses due to make-overs and rejects.
- INCREASED PRODUCTION by making the most efficient use of skilled and unskilled labor.
- HEAVY DUTY CONSTRUCTION. Responsible for dependable performance, economical operation, and minimum maintenance cost.
- GREATEST SAVINGS IN FUEL by using the most economical fuel available.
- MOST ECONOMICAL CORE BINDERS for your particular casting requirements, oil or resin, can be used.

Coleman Tower Oven

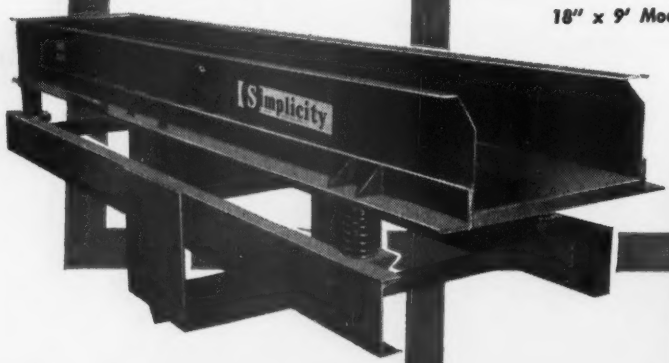


If sand won't flow your foundry can't go!

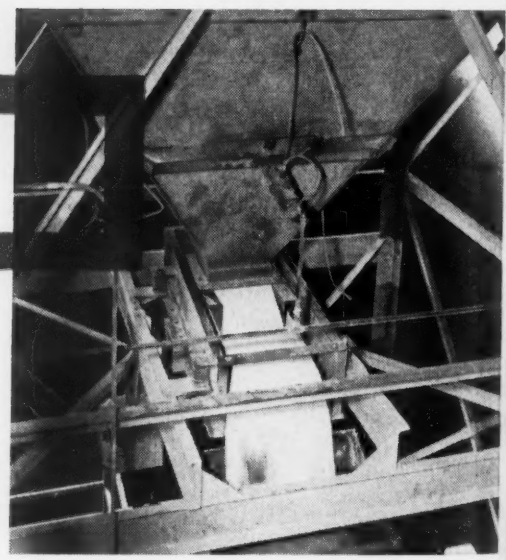
install Simplicity os-a-veyor type bin feeders

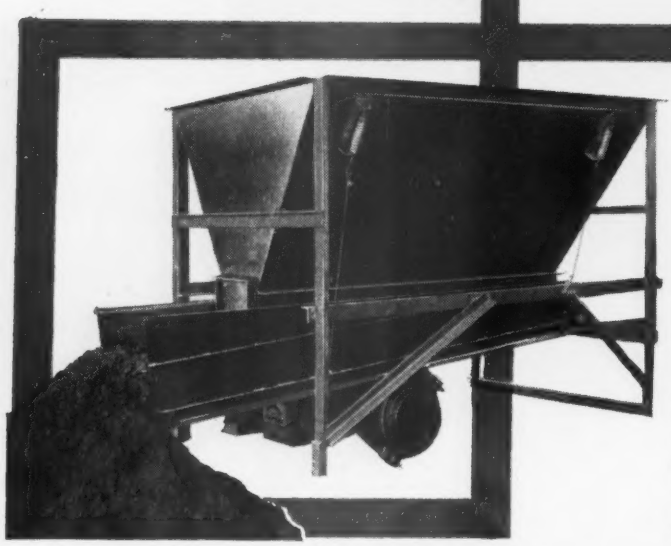
Sand stoppage in your storage bins means lost time on the molding floor and lost production all along the line. You can stop these time losses with Simplicity Os-A-Veyor Type Bin Feeders that greatly reduce the danger of sand bridging and hanging in the bins. Simplicity Feeders, available in lengths from 4′ to 20′ and widths from 12″ to 6′, feed from the full length of the bin. Quality of sand is also improved because the sand can temper in the bin with actual temper time dependent upon capacity of bin and rate of feed. Molding sand will flow when you want it and a brake type motor on the feeder insures accurate measurement of sand. Improve your molding sand, improve your castings, and improve your production time with Simplicity Os-A-Veyor Type Bin Feeders.

18″ x 9′ Model OA Simplicity Feeder



2′ x 5′ Simplicity Bin Feeder in operation at a big industrial foundry.





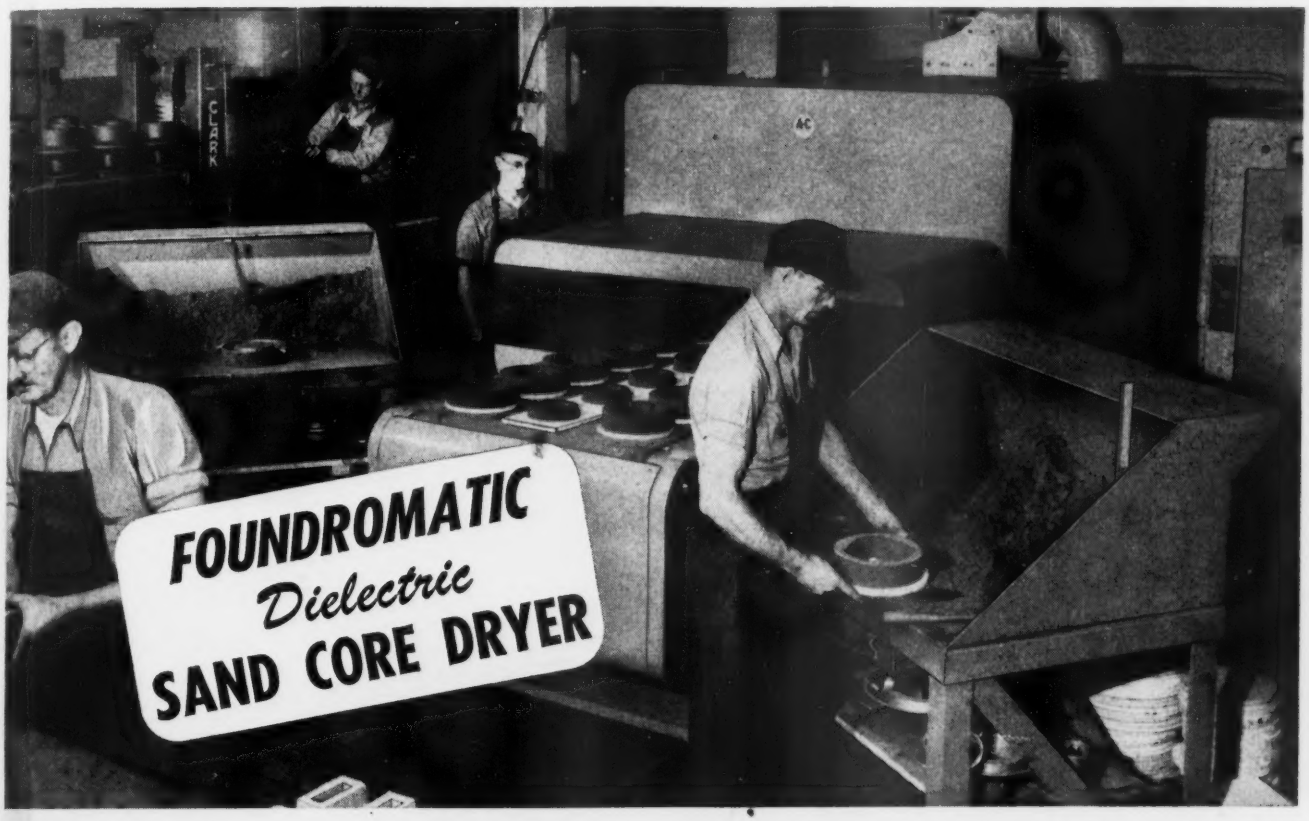
2′ x 10′ two-surface Feeder installed under test bin. In actual operations, a 3′ x 17′ feeder of this type installed at the Buick foundry, Flint, Michigan, handles, at a uniform controlled rate, 100 tons per hour of finished, mulled, and tempered sand feeding from a 150 ton capacity through a 14′ long opening.

89

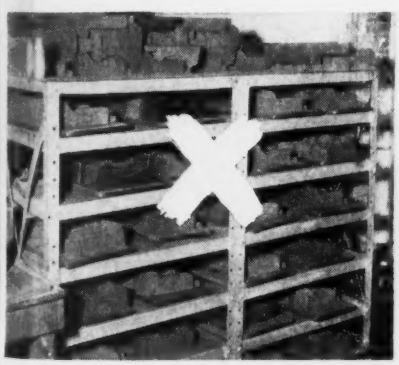
- **Sales Representatives In All Parts Of The U.S.A.**
- **For Canada:** Canadian Bridge Engineering Company, Ltd., Walkerville, Ontario
- **For Export:** Brown & Sites, 50 Church Street, New York 7, N. Y.

Simplicity
TRADE MARK REGISTERED
ENGINEERING CO. • DURAND, MICHIGAN

See How IT TAKES HEAT, FUMES, WASTED TIME OUT OF CORE MAKING

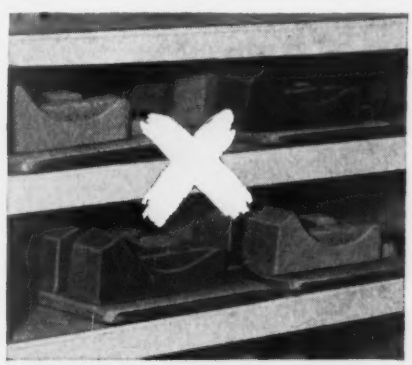


1 Saves drying time! Cores take minutes instead of hours to dry in this clean, modern looking Allis-Chalmers Sand Core Dryer. Cores come out cool, easy to handle, and smoke and fumes are eliminated. Dries any core that will pass through an aperture 36 inches wide and 13 inches high. Cuts fuel costs 30% to 60%.



2 No need to place cores on racks like these for cooling and curing. Cores are cool, dry, ready to use the minute they leave the *Foundromatic* Sand Core Dryer.

3 Storage space like this can be converted to production space because cores can be made up as needed. No need to store up cores and hold them for tomorrow's production.



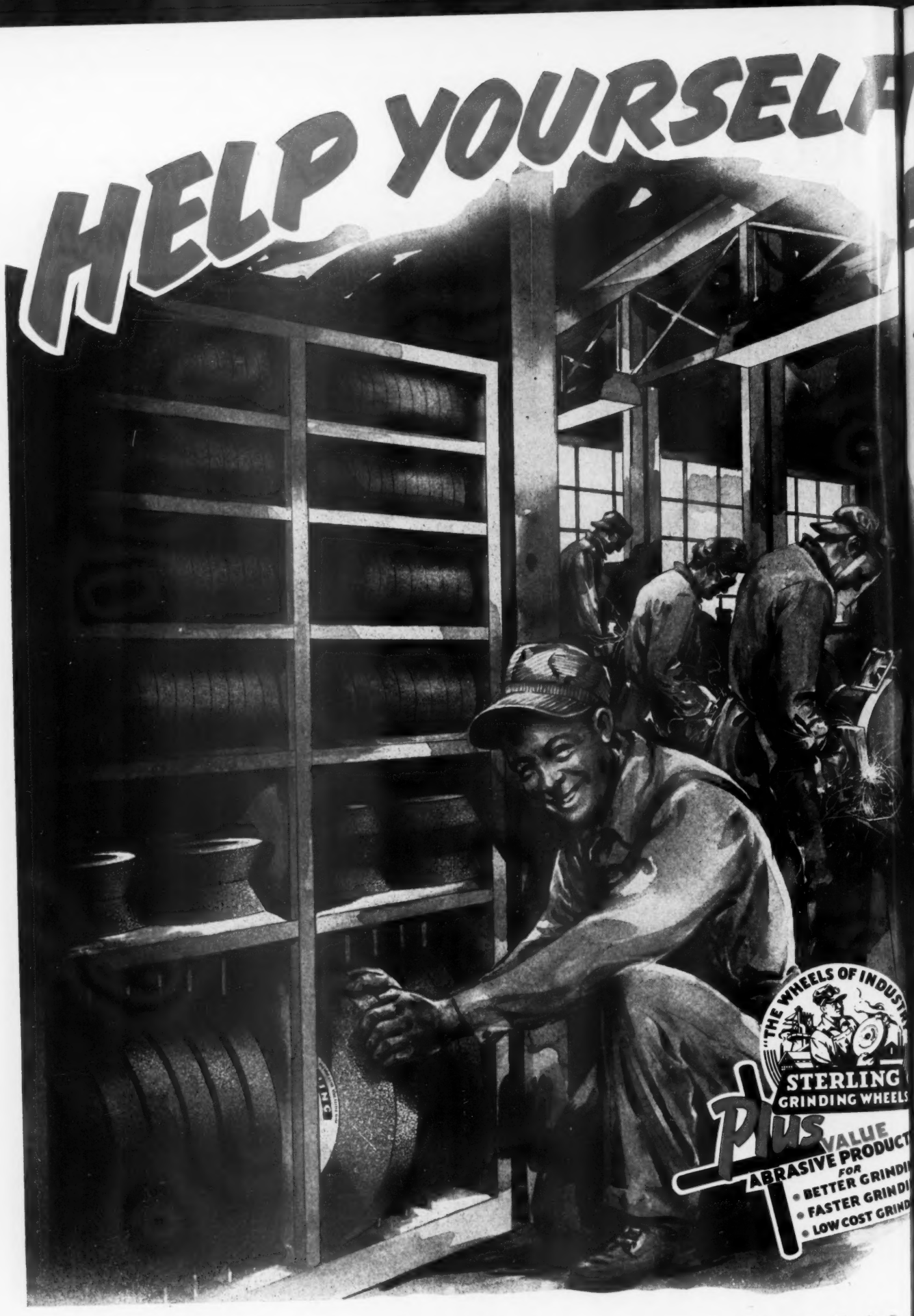
4 Uneven baking illustrated here is eliminated. Every core dried dielectrically is uniformly dried. Burning is impossible even when there are thin sections. Practically eliminates rejects!

A-3260

Foundromatic is an Allis-Chalmers trademark.

ALLIS-CHALMERS

Get details from your nearby Allis-Chalmers District Office or write for booklet 1587306, Allis-Chalmers, Milwaukee 1, Wis.



THE STERLING GRINDING

TO FASTER, BETTER GRINDING

Sterling's VITRIFIED 22 BOND WIDENS THE APPLICATION OF MANY WHEEL SPECIFICATIONS FOR ALL TYPES OF LOW-SPEED, STEEL & MALLEABLE CASTING GRINDING

The recent introduction of Sterling's New 22 Vitrified Bond has made possible an unusual series of low-speed grinding wheels that withstand the hard knocks of severe operations on all types of steel and malleable castings. You can obtain these recently introduced abrasive units that guarantee longer service regardless of unusual operating heat and pressure...wheels that stand up and produce more regardless of tougher than usual grinding conditions.

Sterling's New 22 Vitrified Bond makes possible the application of many important, additional specifications to the demands of your steel and malleable casting grinding problems. Through the use of this recently developed bond, Sterling offers the best possible grinding, whether the wheels be small units for portable grinding or large-diameter wheels for snagging operations.

Sterling's Low-Speed Grinding Wheels, fortified with the New 22 Vitirified Bond, can readily be applied to the solution of many of your grinding problems. Our engineers will welcome the opportunity of working closely with you to eliminate all troublesome job details. Ask us today about the New 22 Bond and how it will make difficult grinding easy. There is no obligation...your letter or telegram will bring quick results.

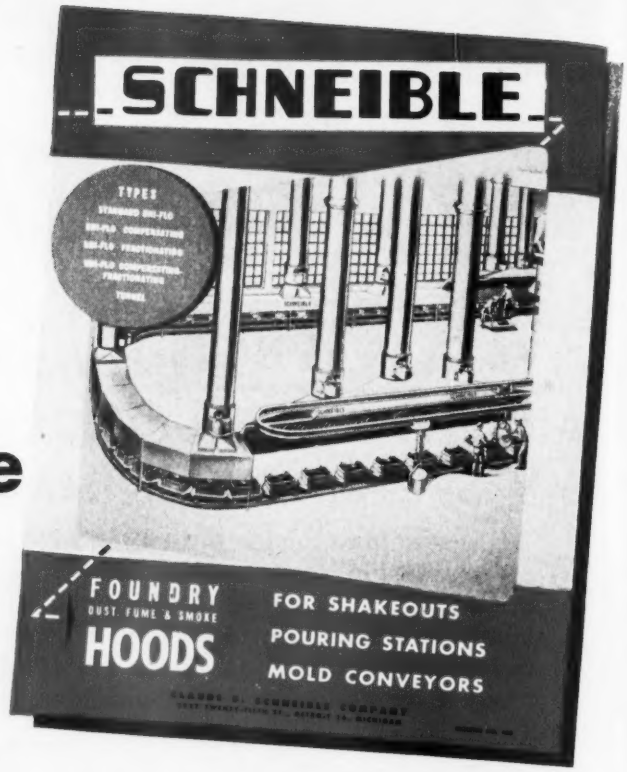
BEST IN THE TEST --- THAT'S STERLING

Among many tests carried out in leading foundries everywhere, results indicate the superiority of the "Wheels of Industry". For example, on one job, a Sterling 24x2x2 wheel, XA164 R7 V22 OB, outperformed all other units. Used for snagging the gates and fins of steel casting tubes, it had a much better cutting action...provided less wheel wear per ton of material. Consistent grinding made these test wheels first choice. Similar results can be yours...may we make a test in your foundry...help you do better, faster grinding?

Ask for These STERLING Research and Development Folders - - -

Various grinding wheel specifications for different types of tools and metals are outlined in these interesting Sterling Research and Development folders which are available upon request. Ask for your copies which will include the popular "Art of Science and Grinding". No obligation. Write and your set of folders will be mailed right away.

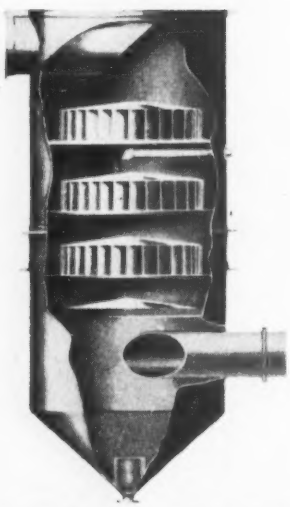
WHEEL DIVISION GRINDING WHEEL INSTITUTE MEMBER TIFFIN OHIO



A Complete Line of STANDARD SCHNEIBLE HOODS

FOR DUST, FUME & SMOKE CONTROL

Ask for Bulletin Number 450



MULTI-WASH COLLECTORS available from 1000 to 36,000 c.f.m. for all dust, fume and smoke control applications.

The latest information on standardized Schneible Uni-flo Hoods for Shakeouts, Pouring Stations and Mold Conveyors is now available for your files.

This comprehensive 16-page two color catalog includes pictures of each type of hood, tells how it functions and its outstanding features.

A section is devoted to standard hood numbers with diagrams and tables of dimensions which will prove helpful in determining requirements for most usual foundry layouts.

Copies will be sent upon request . . . get your copy today!

CLAUDE B. SCHNEIBLE COMPANY

P.O. BOX 502 DETROIT 32, MICHIGAN

SCHNEIBLE

FOUNDRY EQUIPMENT MEMBER FEMA MANUFACTURERS ASSOCIATION INC.

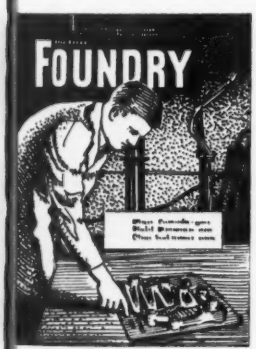
FOUNDRY News Report

April 20, 1951

SITUATION TIGHTER: Amount of materials required for defense production is growing, and this trend probably will continue. Foundries are encountering more difficulty in obtaining needed supplies of raw materials. While most pig iron producers have done a good job in distributing tonnage and avoiding hardship, the iron situation grows more serious. Foreign iron purchases are declining. The foundry scrap supply is inadequate and holds little promise of improvement. Controls on nonferrous metals are crippling nonferrous foundries. Manpower is being lost to war plants, and government agencies permit this situation to grow more critical.

FERROALLOY USERS MUST REPORT: NPA has mailed forms to some 8000 ferroalloy users for reporting monthly alloy requirements. "Melt Sheet" reports for each individual company must be received by the Iron and Steel Division of NPA 30 days in advance of the month in which the company proposes to use the alloys. Approved melting schedules will be returned to melters by the 20th of month preceding scheduled melting. NPA may also delete items or indicate substitution of alloys. Control over use of scarce alloys is provided in an amendment of the basic steel order, M-1. Copies of the form are available at local NPA offices. Foundry operators are quite critical of this melt sheet. Jobbing foundries find it impossible to schedule production 60 days in advance. Also it is pointed out that the amount of information required is most unreasonable. One concession recently granted permits grouping of orders according to end use, instead of following each order through to the pattern number.

SCRAP CEILING ORDER: OPS Ceiling price regulation 5 was amended effective Apr. 24. Definitions of iron and steel scrap have been clarified to distinguish between reusable items and scrap. Premium ceiling prices on specialty grades bought for use in electric furnace and open hearth plants and foundries may be paid only when scrap is for use in such facilities. Specifications have been changed slightly on a number of items including foundry field scrap.



THE COVER: X-raying castings at Eastman Kodak Co. metallurgical laboratory
See page 10

CERTIFICATES OF NECESSITY: From Mar. 7 to Apr. 6, NPA issued certificates of necessity for 396 new or expanded defense facilities costing an estimated $1,310,799,399. Lebanon Steel Foundry, Lebanon, Pa., was certified 75 per cent on a $891,591 expansion for production of armor castings. Other facilities include production of silvery iron, secondary ingot in aluminum and copper-base alloys, primary aluminum, and iron and steel scrap.

CMP: Much of the information on the Controlled Materials Plan will be funneled to industrial organizations through trade associations. In the near future your trade association probably will be sending you forms, instructions and copies of orders establishing the plan.

SCRAP PROGRAM: NPA has not felt the pressure sufficiently as yet to start a public scrap drive similar to those pushed during World War II, but it has inaugurated a program "designed to put high grade iron and steel scrap moving into steel mills and foundries." NPA is requesting immediate and continued help from every industrial and government source. Many foundrymen believe the heavy price rollback is responsible for the present near chaotic condition of the foundry scrap market, and that the situation will not improve much until a more realistic pricing policy is adopted by OPS.

SMALL BUSINESS IN DEFENSE: Munitions Board has adopted new procurement policies to provide maximum aid for American small business to participate in the defense program. The program, announced by John D. Small, chairman of the Munitions Board, includes: 1—Assigning small business specialists to each armed service procurement office; 2—Affirmation of policy calling for maximum use of available facilities; 3—Agreement upon payments of justifiable price differential in negotiated procurements to broaden the base of suppliers; 4—A fixed program of encouragement of subcontracting; and 5—A

provision to divide many negotiated procurements into small lots to allow multiple awards. The Munitions Board has published an "Index of Military Purchasing Offices," a guide to industry in selling to military departments.

ARMY INSPECTION: Chicago Ordnance District has opened inspection sub-offices at Rockford, Ill., Milwaukee and Minneapolis, according to Col. S. R. Stribling, district chief. Additional sub-offices may be opened later to serve district territory in Illinois, Indiana and Iowa. Lt. Col. Alton V. Stallard has been appointed chief of the industrial division of the Chicago Ordnance District.

FORD IN CLEVELAND: While the engine plant being built by the Ford Motor Co. in Cleveland is expected to start limited production in May, the new foundry is reported somewhat behind schedule and possibly requiring another year for completion. Meanwhile the engine plant will get blocks from Ferro Machine & Foundry Co., Cleveland.

PLANT SECURITY: Uniform procedures are being established by various branches of the Armed Services to cover matters relating to security, such as plant visitors, establishment of classified material, plant protection measures, etc. Meanwhile industrial plants are asked to review the security measures they took during the last war with the view to their reinstatement.

FORT PITT MALLEABLE OPENS: Fort Pitt Malleable Iron Division, Steel Trading Corp., Pittsburgh, began operations in late April after extensive repairs to melting and annealing furnaces and other facilities. Edward W. Wright is general manager and Donald A. Kilpatrick, formerly with Lake City Malleable Inc., Ashtabula, O., is assistant general manager. Plans for increased output and further plant mechanization are being considered.

OBITUARY: Since the main section of this issue went to press, we have received word of the death of Stanley W. Brinson, master molder at the Norfolk Naval Yard, and Dr. Heinrich Ries, former head of the geology department, Cornell University and pioneer in sand research. Obituaries will be presented in the June issue.

PRICES OF FOUNDRY METALS AND COKE

(As of Apr. 20, 1951)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE	
Connellsville	$17.00-18.00
New River	19.50
Wise County	15.95
OVEN	
Birmingham	$20.30
Chicago	23.00
Detroit	24.00
Erie, Pa.	23.50
Everett, Mass.	24.80
Indianapolis	22.75
Kearney, N. J.	22.75
Milwaukee	23.75
Painesville, O.	24.00
Philadelphia	22.70
Neville Island (Pittsburgh)	23.00
Portsmouth, O.	22.50
St. Louis	24.25
Swedeland, Pa.	22.00
Terre Haute, Ind.	22.50

PIG IRON

(Per gross ton, f.o.b. furnace)

	No. 2 Foundry	Malleable
Bethlehem, Pa.	$54.50	$55.00
Birmingham	48.88	....
Buffalo	52.50	53.00
Chicago	52.50	52.50
Cleveland	52.50	52.50
Everett, Mass.	53.25	53.75
Fontana, Calif.	58.50	....
Geneva, Utah	52.50	....
Granite City, Ill.	54.40	54.90
Lone Star, Tex.	48.50	48.50
Neville Island (Pittsburgh)	52.50	52.50
Steelton, Pa	54.50	55.00
Swedeland, Pa.	56.50	57.00
Toledo, O.	52.50	52.50
Troy, N. Y.	54.50	55.00
Youngstown, O.	52.50	52.50

NONFERROUS INGOTS

BRASS AND BRONZE: 85-5-5-5—29.00c; 88-10-2—43.25c; 80-10-10—35.00c; No. 1 yellow—25.00c. **ALUMINUM:** 99 per cent plus, primary ingots 19.00c. Secondary No. 12 alloy 29.50-30.25c. **MAGNESIUM:** 99.8 per cent standard ingots 24.50c, f.o.b. Freeport, Tex. **COPPER:** Electrolytic 24.50c, Connecticut valley; Lake 24.61½c, delivered. **ZINC:** High grade 18.60c, delivered.

IRON AND STEEL SCRAP

(Ceiling prices per gross ton as established by the Office of Price Stabilization)

	*No. 1 Heavy Melting Steel	**Steel, 2 ft & less	Punchings, Plate Scrap	Cast Iron Briquets
Birmingham	$39.00	$41.00	$41.50	$39.00
Buffalo	43.00	45.00	45.50	43.00
Chicago	42.50	44.50	45.00	42.50
Cincinnati	43.00	45.00	45.50	43.00
Cleveland	43.00	45.00	45.50	43.00
Detroit	41.15	43.15	43.65	41.15
Eastern Pa.	42.50	44.50	45.00	42.50
Los Angeles	35.00	37.00	37.50	35.00
Pittsburgh	44.00	46.00	46.50	44.00
San Francisco	35.00	37.00	37.50	35.00
St. Louis	41.00	43.00	43.50	41.00
Seattle	35.00	37.00	37.50	35.00

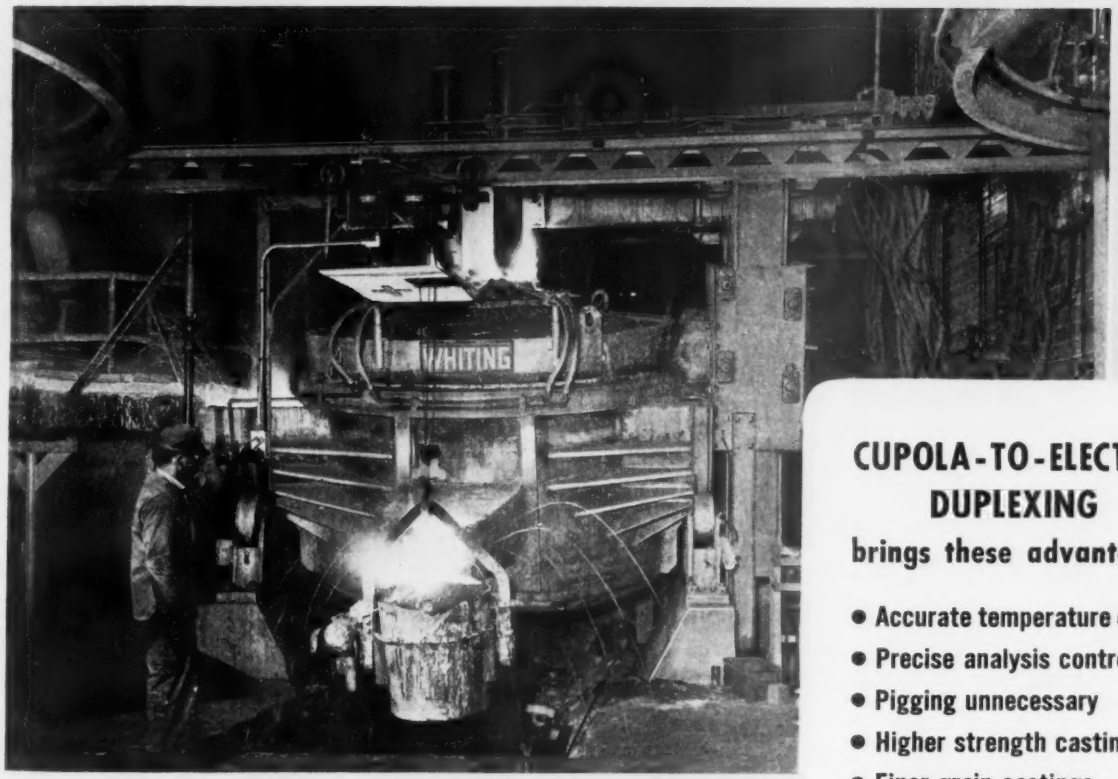
Above delivered prices are ceiling levels at basing points indicated. * Applies to dealer and industrial scrap; railroad heavy melting is $2 higher. ** Foundry steel 1 ft and under is $2 higher.

CAST IRON SCRAP

No. 1 cupola cast	$49.00
Heavy breakable cast	45.00
Burnt cast iron	41.00
Cast iron brake shoes	41.00
Stove plate	46.00
Clean auto cast	52.00
Unstripped motor blocks	43.00
Iron wheels, No. 1	47.00
Malleable	55.00
Drop broken machinery cast	52.00

Above ceiling prices, per gross ton, are f.o.b. shipping point. Add transportation charges to obtain delivered prices at any foundry.

HOTTER METAL • BETTER ANALYSIS • LOWER COST
with Cupola-to-Electric Duplexing



CUPOLA-TO-ELECTRIC DUPLEXING
brings these advantages

- Accurate temperature control
- Precise analysis control
- Pigging unnecessary
- Higher strength castings
- Finer grain castings
- Permits continuous pouring
- Ladles filled faster
- Pouring delays eliminated
- Increased yield from alloys
- Less machine tool wear and breakage
- Faster machining speeds
- Fewer machine shop rejections

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

Where Whiting* Cupolas are used for prime melting and a Hydro-Arc* Furnace for finishing, foundrymen secure greatly improved results—in product quality, cost, and ease of operation.

The Hydro-Arc Furnace "levels off" the variable analysis of stratified cupola charges. It permits checking and correcting both the analysis and the temperature of the metal *BEFORE* it enters the mold. A chilled ladleful can be poured back into the furnace to make good castings, instead of pigs and scrap.

Some iron foundries, whose production tonnage does not warrant duplexing, are using only Hydro-Arc Furnaces for continuous or batch melting. This practice is not only practical from a cost standpoint, but it eliminates the uncertainties due to poor quality coke, scrap, etc.

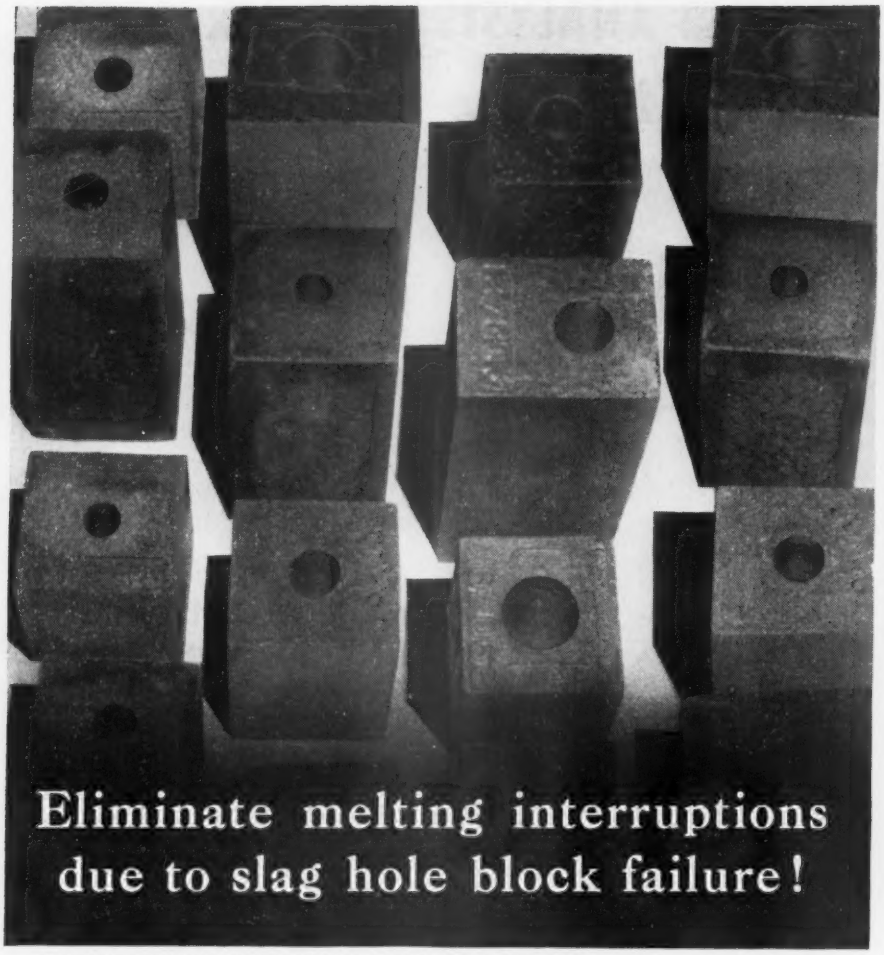
Bulletin FY-168 gives detailed information about the Whiting Hydro-Arc Furnace—write for a copy.

**Reg. U. S. Pat. Off.*

WHITING
CORPORATION

15607 Lathrop Ave. Harvey, Illinois

Offices in Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis, and Seattle. Representatives in other principal cities. Canadian Subsidiary: Whiting Corporation (Canada) Ltd., Toronto, Ontario. Export Department: 30 Church St., New York 7, N. Y.



Eliminate melting interruptions due to slag hole block failure!

NORTON CRYSTOLON SLAG HOLE BLOCKS LAST LONGER because these densely bonded, chemically inert silicon carbide blocks resist corrosion, erosion and penetration of slag 5 to 15 times longer than fire clay blocks.

More and more foundries, fed up with interruptions of melting campaigns due to slag hole block failure, are replacing fire clay blocks with silicon carbide blocks made of Norton Crystolon* refractory. You can profit from their experience.

Look at what you'll get. No softening or spalling at temperatures up to 3050° F. Resistance to slag corrosion, erosion and penetration 5 to 15 times longer than fire clay blocks. More production per shift.

Test Crystolon Blocks!

It will pay you to compare the performance of Norton Crystolon slag hole blocks with whatever you are now using. For prices and complete information, contact your nearby Norton representative or write us direct. Norton Company, 303 New Bond St., Worcester 6, Mass.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

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Making better products to make other products better

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Canadian Representative

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Offers valuable guides to top performance

Everything you need to know about refractory cements is covered in this fact-packed bulletin:

HOW TO SELECT the right fused alumina, silicon carbide or fused magnesia cement for metal melting, brick laying, resistor imbedding, or ramming burner tunnels. This subject is covered by two comprehensive, cross reference tables.

HOW TO PREPARE refractory cement for casting, troweling, ramming and pressing—is thoroughly covered.

HOW TO APPLY refractory cement by the various methods — is treated in great detail.

Get Your Free Copy

This bulletin, result of exhaustive laboratory field tests by Norton refractory engineers, will make a valuable addition to your library of refractory information.

Write for Bulletin 863

NORTON COMPANY
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KEOKUK ELECTRO-SILVERY

Yes, here's *your* unbeatable trio . . . Keokuk 60 lb. pigs for blocking the open hearth heat . . . 30 lb. pigs and 12½ lb. piglets for charging the cupola. "Pig for pig . . . car for car," the quality and uniformity of Keokuk Electro-Silvery *never* varies!

KEOKUK ELECTRO-METALS COMPANY

Keokuk, Iowa • Wenatchee Division: Wenatchee, Washington

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Miller and Company

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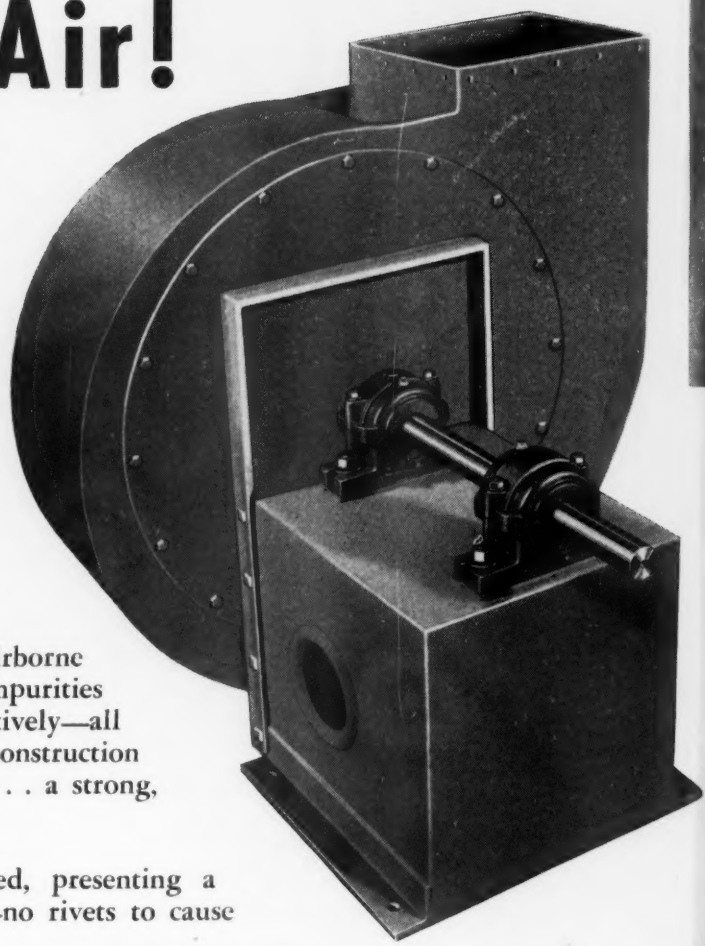
- 3504 Carew Tower, Cincinnati 2, Ohio
- 407 N. Eighth St., St. Louis 1, Missouri

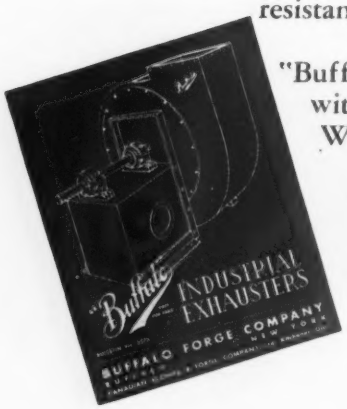
"VACUUM CLEANER" For Your Air!

"Buffalo" INDUSTRIAL EXHAUSTER



Here's the fan to "sweep out" the airborne grit, fumes, moisture and other impurities from your air efficiently and positively—all shift long. As the photo shows, construction is of heavy plate, all welded . . . a strong, durable unit.

Rotors, too, are all-welded, presenting a smooth interior surface—no rivets to cause resistance.



"Buffalo" Industrial Exhausters may be had with "AW" Air Wheels or "MW" Material Wheels, both interchangeable.

Put one of these "workhorse" fans on your removal job, and watch the dirt fly—out the discharge duct!

WRITE TODAY for Bulletin 3576, which gives complete construction data.

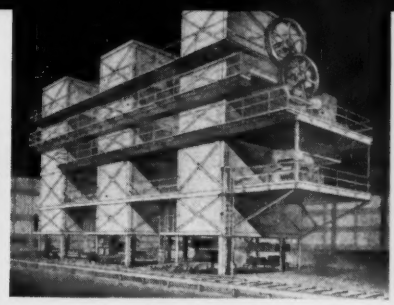
"Buffalo" FIRST FOR FANS

BUFFALO FORGE COMPANY

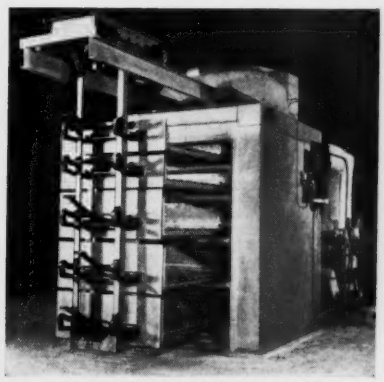
221 MORTIMER ST. BUFFALO, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Branch offices in all Principal Cities

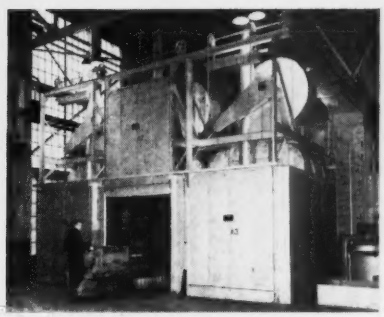
VENTILATING FORCED DRAFT | AIR WASHING COOLING | AIR TEMPERING HEATING | INDUCED DRAFT EXHAUSTING PRESSURE BLOWING



VERTICAL CORE OVENS
at General Steel Castings Co.



ROLLING DRAWER CORE OVEN
at Aluminum Co. of America



RACK TYPE CORE OVENS
at Aluminum Co. of America

CARL-MAYER
CORE AND MOLD OVENS

Outstanding Engineering

ALSO OTHER TYPES OF INDUSTRIAL OVENS, AND FURNACES.

OUR CUSTOMERS

Important concerns like these:

Aluminum Co. of America
American Brake Shoe Co.
American Radiator Co.
Blaw-Knox Co.
Brown Industries
Buick Motor Div. of General Motors Corp.
Bucyrus-Erie Co.
Cadillac Motor Div. of General Motors Corp.
Columbia Steel Corp. (U.S. Steel Corp.)
Crucible Steel Castings Co.
Dunkirk Radiator Co.
Eclipse Aviation Division of Bendix Aviation Corp.
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Ford Motor Co.
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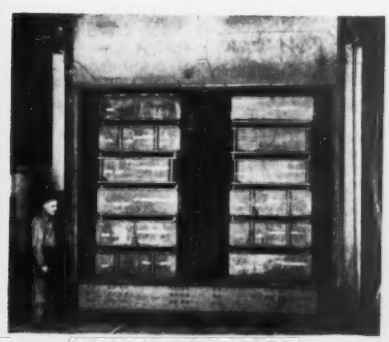
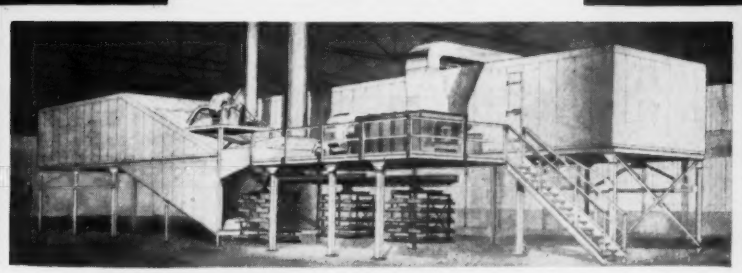
Gilbert & Barker Co.
General Steel Castings Co.
Golden Foundry Co., Inc.
Henry Kaiser Corp.
W. O. Larson Foundry Co.
Mesta Machine Co.
F. E. Meyers & Bro. Co.
Oil Well Supply Co. (U. S. Steel Corp.)
Packard Motor Car Co.
H. B. Salter Co.
Shenango Penn Mold Co.
Standard Foundry Co.
Union Brass & Metal Mfg. Co.
Union Steel Castings Co.
West Steel Castings Co.
A. C. Williams Co.
Whiten Machine Works
Whiting Corp.



CAR TYPE MOLD OVEN
at Oil Well Supply Co.



HORIZONTAL MONORAIL CORE OVEN at Eclipse Aviation Co.

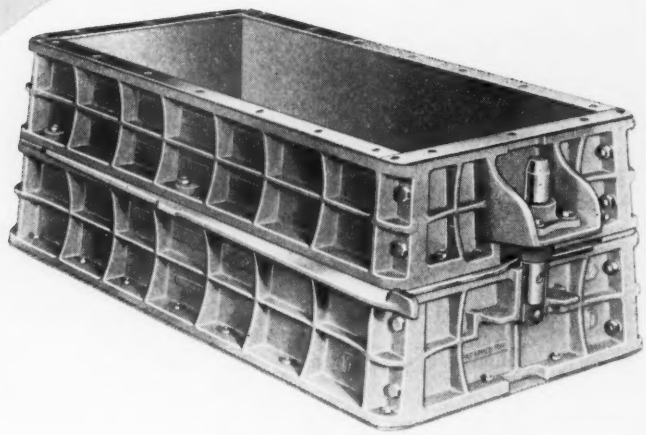
Write for Bulletins No. 141 and 350

THE CARL-MAYER CORPORATION

3030 Euclid Avenue • Cleveland, Ohio

BACKED BY REPUTATION AND OVER 30 YEARS' EXPERIENCE

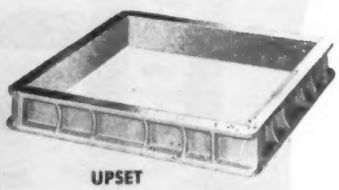
When we say they up production . . . we mean UP!



FREMONT MAGNESIUM SLIP FLASKS

are lighter, magnesium castings weighing 1/3 less than aluminum,—yet they have *twice* the tensile strength . . . the strength to withstand long, continuous usage in machine molding. Note the solid, bolted and welded corner construction, the steel faced top and bottom flanges. They're *really* heavy duty though ever so much easier to handle.

Fremont magnesium slip flasks furthermore assure exacting work. Consider the accurately machined inside surfaces and flanges, and the one-inch diameter hardened and ground GROOVLOCK FOOLPROOF PIN which assures perfect alignment indefinitely. The GROOVLOCK PIN is particularly adapted to cope or drag pattern jobs. However, other types of standard pin fittings can be supplied if desired.



UPSET

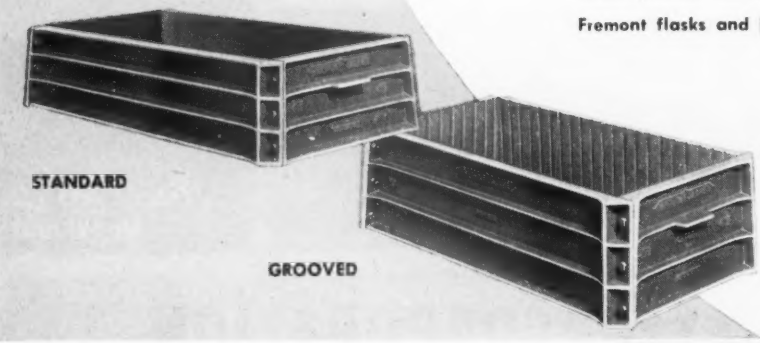
FREMONT CAST IRON OR CAST ALUMINUM JACKETS

The precision machined and drilled, bolted corner construction saves you real money. New sides or ends can be inserted by simply removing a few bolts. *The entire jacket need not be scrapped.*

Inside surfaces are rough disc ground.

The standard style is for ordinary foundry practice and the grooved style, which permits ready gas escape, for steel foundries.

Fremont flasks and jackets can be assembled on a 3°, 4° or 5° taper.



STANDARD

GROOVED

Write today for literature.

The Fremont flask co.

FREMONT, OHIO

Annealing Time Cut 61%

How General Metals Corp. reduced annealing time from 84 to 32 hrs.

Like many other progressive companies, such as the General Metals Corporation, Vernon, California, you may find you can drastically cut annealing time, reduce annealing costs, and achieve better, more uniform results by installing G-E electric furnaces.

General Metals, for example, reduced the annealing cycle for malleable iron from 84 to 32 hours by installing G-E elevator furnaces, which occupy only half the floor space formerly required by fuel-fired furnaces!

CUT COSTS In addition, General Metals cut costs considerably by eliminating the packing, shaking out, cleaning and tooling operations which their operators had to perform using fuel-fired furnaces.

ASSURE QUALITY ANNEALING Because the G-E furnaces provide automatic control of the temperature and heat-treating cycle, along with uniform heat distribution, uniform quality of annealing is assured . . . even with unskilled help.

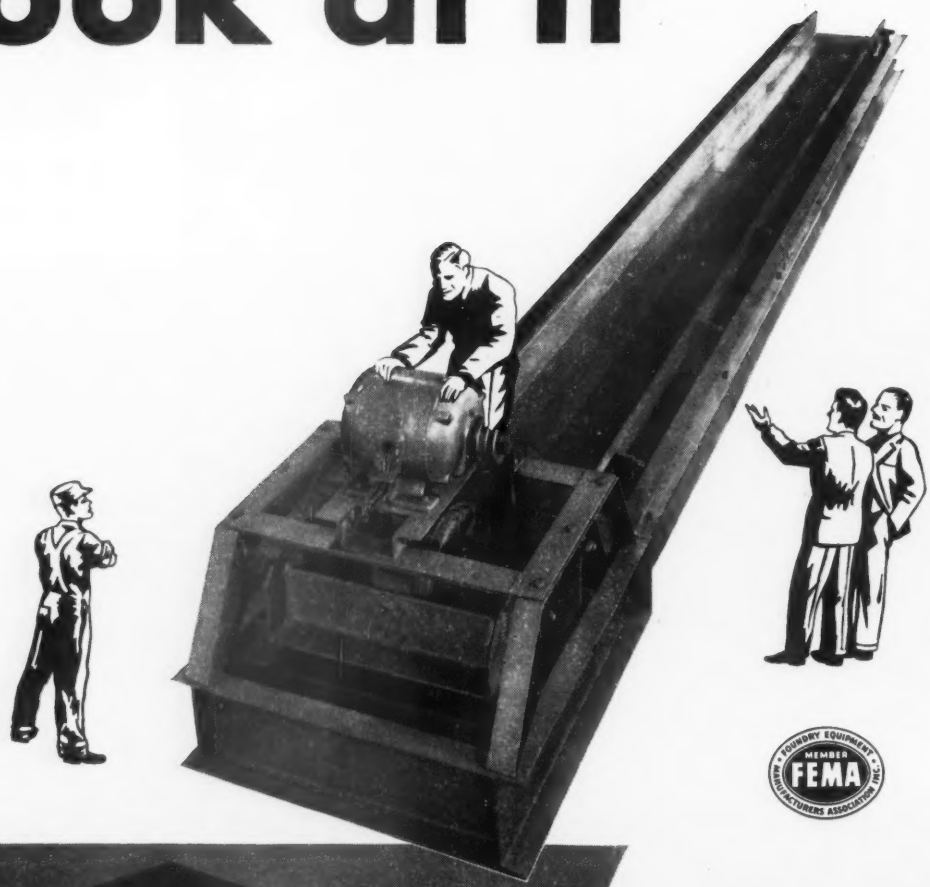
General Electric builds a complete line of electric furnaces, gas atmosphere equipment, induction and dielectric heaters, and small heaters and heating devices. Just contact the G-E Apparatus Sales Office nearest you to obtain the recommendations of an Industrial Heating Specialist or write to: *Sect. 720-40, Apparatus Dept., General Electric Co., Schenectady 5, N. Y.*

720-40

Electric Furnaces For Annealing • Brazing • Drawing • Carburizing • Enameling • Hardening • Normalizing • Sintering • Steel Mill Applications

GENERAL ELECTRIC

every way you look at it



AJAX LO-VEYORS

are one of your best Material Handling Answers

● According to cost figures, surveys, editorial comment and common sense,– the best way to cut cost today is to cut the cost of materials handling.

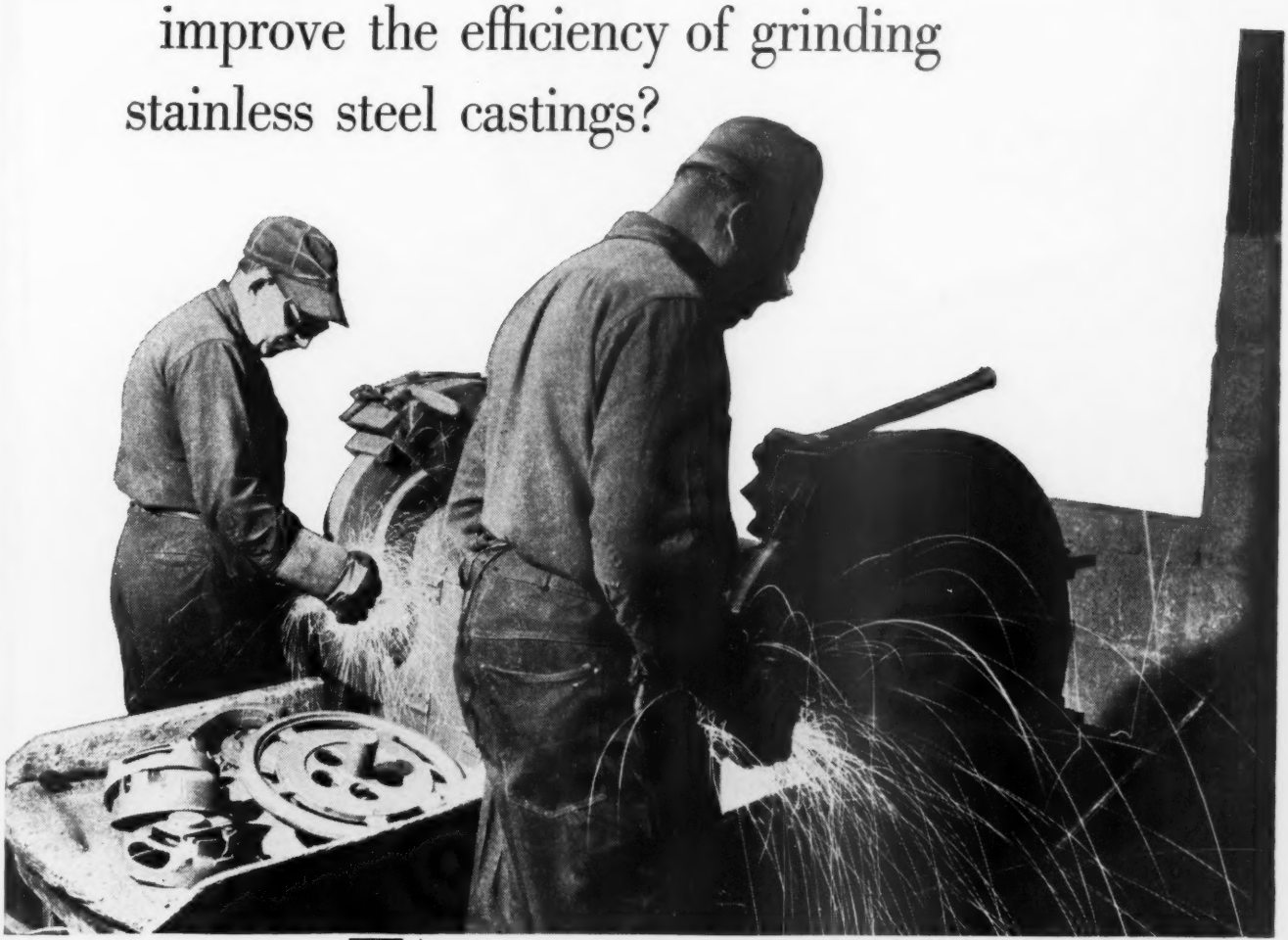
Ajax Lo-Veyors give you a complete, self-contained means of conveying dry aggregates (bulk materials). Use of the Ajax-Shaler Shaker provides a reciprocating drive which eliminates dozens of idler bearings, head and tail pulleys and eccentric shafts.

Ajax Lo-Veyors are available in open and closed pan and tubular types. They provide gas tight construction for critical processes and explosive operations.

Widely used by leading foundries. Write giving outline of your requirements.

AJAX FLEXIBLE COUPLING CO. INC., 204 English St., WESTFIELD, N.Y.

What's U. S. Rubber doing to improve the efficiency of grinding stainless steel castings?



GRINDING STAINLESS STEEL CASTINGS. This large foundry specifies "U. S." wheels; prefers them because they grind with high efficiency and treat the castings right.

GRINDING THE "GATES" off a stainless steel valve housing casting, with a U. S. *Royalite* Wheel.

CLOSE-UP of high-speed portable grinder smoothing castings.

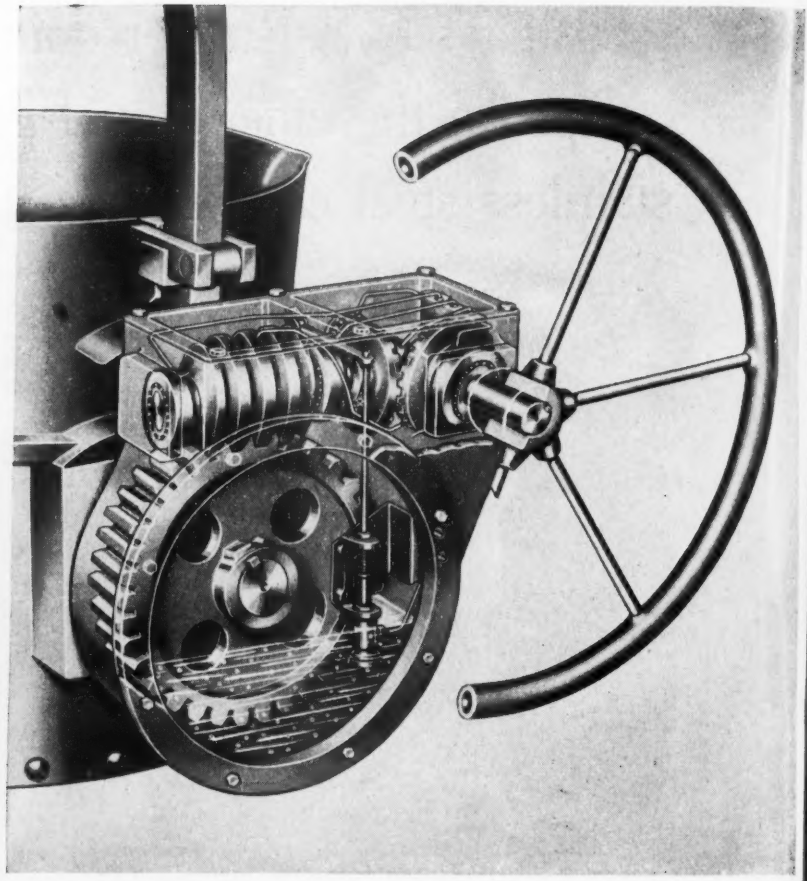
Backed by over 88 years of experience in the abrasive industry, U. S. Rubber technicians have developed wheels that efficiently handle even the specialized problems presented when grinding stainless steel. This extensive "know-how" also puts U. S. Rubber in a position to provide you with wheels for grinding malleable iron, gray iron, steel, and Mechanite castings. There is a U. S. *Royalite* wheel for your job. Put your grinding wheel problem in the hands of U. S. Rubber technicians. Write to address below.

PRODUCTS OF U.S.RUBBER SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION, ROCKEFELLER CENTER, NEW YORK 20, N. Y.

New Worm Ladle Gearing ELIMINATES GASKET ADJUSTMENTS



. . . WORM AND BEVEL GEAR ASSEMBLY COMPLETELY ADJUSTABLE

Here is another Industrial Equipment Company first . . . new, improved worm ladle gearing bringing *complete universal adjustability.*

Take a close look at the phantom view. Here is a one-piece, self-contained unit with all parts easily accessible. Your maintenance man can quickly make back-lash adjustments to pin-point accuracy and positive adjustment by adjusting the bearing lock nuts on all gears and worm. These nuts are easily reached and with working space to spare.

Unaffected by Heat

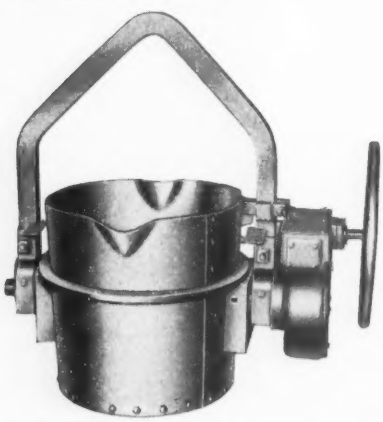
There is no connection between the bail and the gearing. No clearance for heat distortion is necessary, permitting an assembly almost to machine tool precision.

Industrial's new gearing is absolutely safe and positively self locking. The high ratio between worm and worm gear locks the ladle in any position. Incidentally, worm and bevel gears are of high tensile semi-steel and the worm is of high alloy steel. All are precision cut. Shafts are mounted on anti-friction bearings.

Now Standard Equipment

All Industrial geared ladles are now supplied with this outstanding new type of gearing. In addition, this gearing can be supplied for any Industrial worm geared ladles now in operation. *Write for details.*

- **Completely enclosed and self contained**
- **Automatic force-feed lubrication**
- **Positively self locking in any position**
- **Precision cut gears**



Model 592T ladle with new type gearing. Also notice use of Industrial Equipment's much talked-about UNIVERSAL BAIL. This bail completely eliminates binding due to heat distortion or misalignment. Rigid bail also available.

Do you have our revised catalog No. 35?

Industrial
EQUIPMENT COMPANY
115 N. Ohio St., Minster, Ohio

LADLES • BOWLS • SHANKS • BAILS • TONGS • SPECIAL EQUIPMENT

this giant WHEELABRATOR®

cleans 3½ tons of castings in 10 minutes

The 60 x 96" Wheelabrator Tumblast is a production giant that will clean 63 cu. ft. of material—or more than three tons of castings at a time. This gigantic machine, the largest batch type blast mill made, is slashing cleaning costs and maintaining amazing production schedules in every foundry in which it is installed.

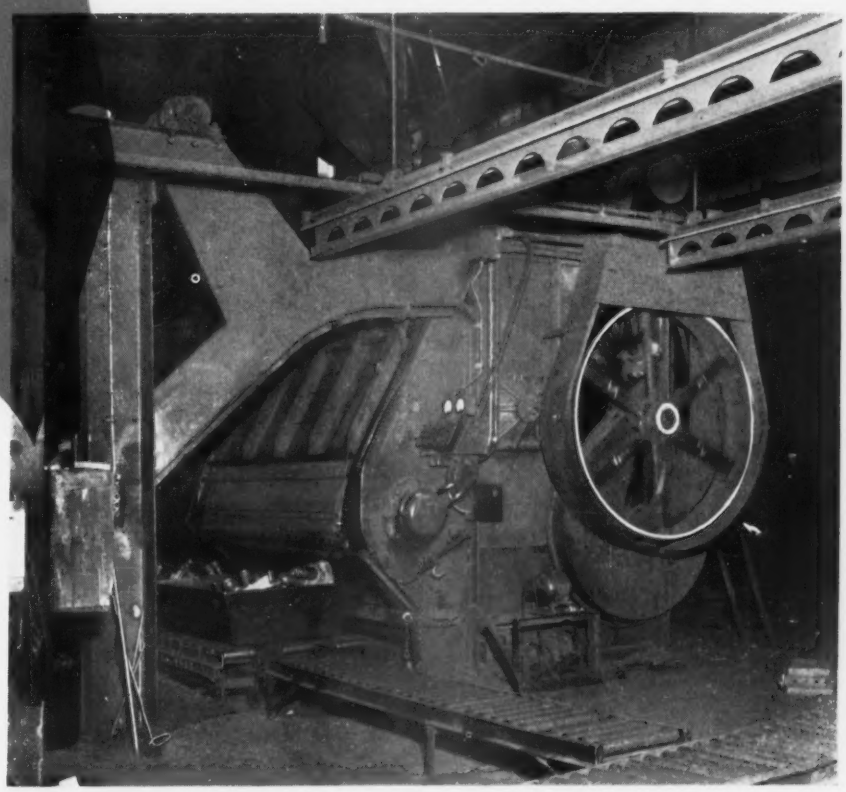
At West Michigan Steel Foundry Company, Muskegon, Michigan, for example, the high speed cleaning and large capacity of this machine are paying rich dividends. It has reduced manpower requirements 60% and has effected direct cost savings of $1,491.00 each month.

SAVES 9,340 MAN HOURS AND $17,898.00 ANNUALLY

It takes only 19 man hours daily to operate the giant Tumblast compared to 50 man hours required for the three airblast rooms formerly operated 24 hours a day. Cleaning costs per ton have been reduced from $3.56 to $2.11.

CLEANS CASTINGS WEIGHING FROM ¼ LB. TO 2800 LBS.

Castings are cleaned three times—in the green stage with gates and risers attached, after annealing, and again after grinding and welding. Cleaning time is surprisingly low due to the perfected tumbling action of the machine and the hard hitting abrasive blast of two Wheelabrator units. In fact it cleans more castings in ten minutes than the average machine cleans in an hour.



GET THE FACTS TODAY on this PRODUCTION GIANT

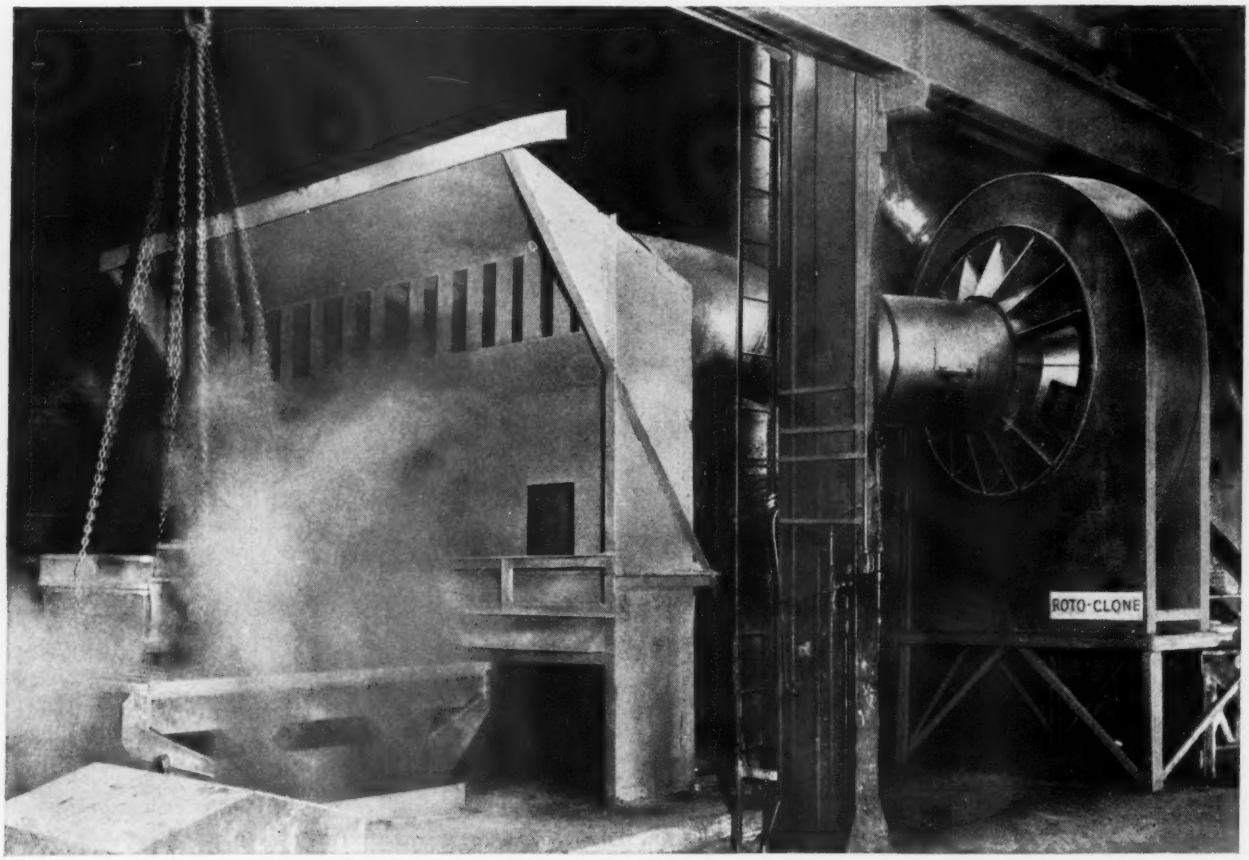
Complete, concise information on all phases of airless blast cleaning is yours for the asking. Write today for catalog No. 74B.

American WHEELABRATOR & EQUIPMENT CORPORATION

505 S. Byrkit St., Mishawaka 2, Indiana

WORLD'S LARGEST BUILDERS OF AIRLESS BLAST EQUIPMENT

today's best buy is better air!



Type W Roto-Clone and AAF's Side Hood adapted to heavy shakeout.

eliminate dust and fumes for PEAK PRODUCTION

AAF ROTO-CLONES increase production . . . save man-hours . . . cut maintenance costs!

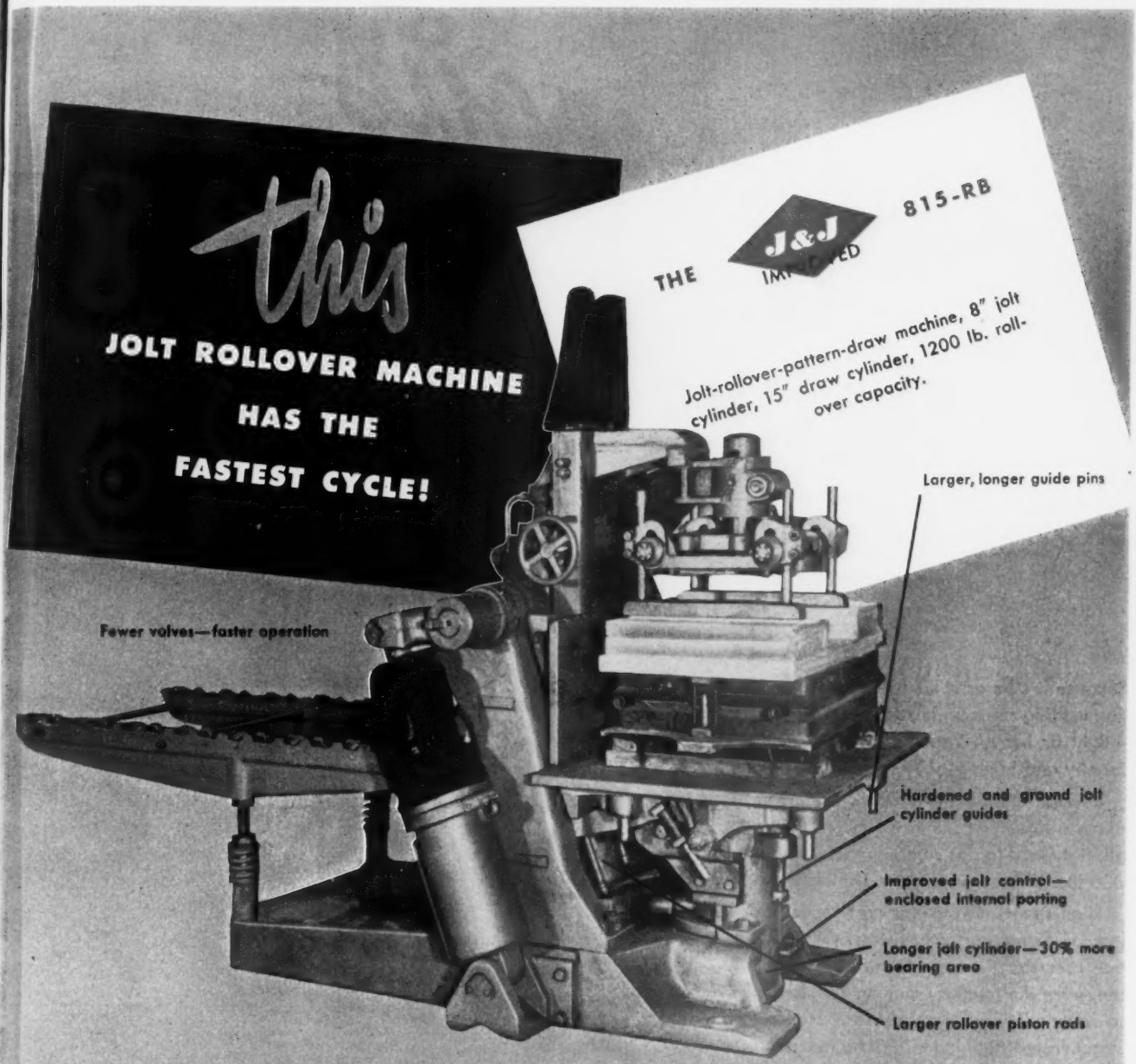
Dust and noxious fumes impair both mechanical and human efficiency. The foundry shakeout is one source for these "spoilers" that is tough to control. However, AAF Type W Roto-Clone* dynamic precipitator, designed and engineered specifically for this problem, has proven its high efficiency in thousands of foundry dust control installations. Consider these performance characteristics of Type W Roto-Clone:

- High efficiency in collecting both coarse particles and extreme fines in excessive concentrations.
- Continuous operation at peak efficiency without interruption for reconditioning or service.
- Maintains constant exhaust air volumes for correct conveying velocities.
- Combines dynamic precipitation with wet collection to eliminate secondary dust problem of disposal.
- Low installation and operating costs.
- Compact, self-contained design requires minimum space — there's always room for a Roto-Clone.
- Large number of sizes affords great flexibility for any exhaust requirements.

For complete information on Roto-Clones see your nearby AAF representative or write for Engineering Bulletin No. 270.

**ROTO-CLONE, is the trade-mark (Reg. U.S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydro-static precipitator types.*

AAF American Air Filter
COMPANY, INC.
266 Central Ave., Louisville 8, Kentucky • In Canada: Darling Brothers, Ltd., Montreal, P.Q.


this
JOLT ROLLOVER MACHINE
HAS THE
FASTEST CYCLE!
THE J&J IMPROVED 815-RB
Jolt-rollover-pattern-draw machine, 8" jolt cylinder, 15" draw cylinder, 1200 lb. rollover capacity.
Larger, longer guide pins
Fewer valves—faster operation
Hardened and ground jolt cylinder guides
Improved jolt control—enclosed internal porting
Longer jolt cylinder—30% more bearing area
Larger rollover piston rods

Why the fastest cycle? Because in the Johnston & Jennings rollover cycle, two time-consuming operations have been eliminated. After rollover, it is unnecessary to raise a separate draw cylinder and equalize. Also eliminated is the unclamping operation necessary in the standard rollover cycle. Clamping and equalizing operations are combined in the downward stroke of a single double-action clamp and draw cylinder. Then, after rollover, this same cylinder draws the mold on its reverse stroke. No transfer of the mold load—no clamping and unclamping necessary.

The no-transfer-of-load principle is not only faster, but assures a more accurate draw. Since the draw cylinder is integral with the table at all times, there is no chance of misalignment. Precision-machined cylinder slides give further assurance of an accurate draw.

No pits are required for the installation of these machines. Today's rapidly changing production picture may necessitate changes in your foundry layout at any time . . . and a pit can't be moved.

Use a Johnston & Jennings jolt-rollover-draw for your toughest production molding job, or use it as a rollover-draw machine in conjunction with a Sandslinger or Speedslinger. It pays to investigate . . . write today for complete information.

MOLDING MACHINE DIVISION
THE JOHNSTON & JENNINGS COMPANY
Div. of Pettibone Mulliken Corp.
2424 North Cicero Ave., Chicago 39, Illinois

J&J

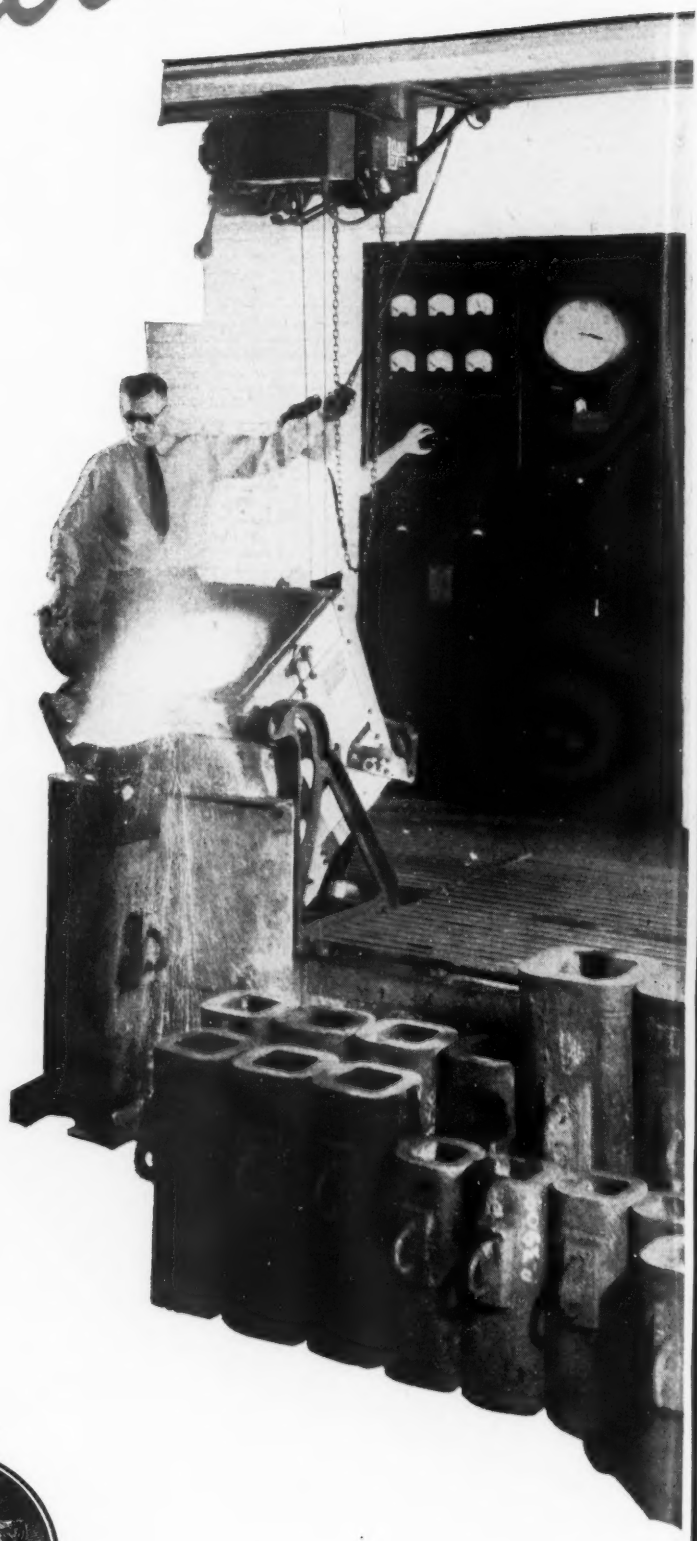
IT'S ONE OF AN IMPROVED LINE!

- Jolt-Rollover-Pattern-Draw Machines
- Jolt-Stripper or Pin-Lift Machines
- Jolt-Squeeze Machines
- Jolt-Squeeze-Pin-Lift Machines
- Plain-Air-Jolt Machines

Homogeneous

ALLOYS

FROM AJAX-NORTHRUP FURNACES



Because it stirs as it melts, the Ajax-Northrup induction melting furnace thoroughly mixes all constituents —light or heavy. You can depend on absolute uniformity and homogeneity in every heat.

Its high speed plus quick changeovers from one alloy to another make it the most flexible furnace of all. It melts a ton of steel in an hour with 600 kw, or 200 lbs. of brass in 22 min. with 100 kw.

High speed also means no time for oxidation, no loss of expensive constituents. Of its close control, one user says "once you get the technique worked out, even the toughest melting problems are reduced to routine." Comfortable, too, because all the heat is generated right in the melt by induction.

Capacities from 8 oz. to 50 lbs. with converter power source, and from 10 lbs. to several tons with motor-generator power. Tilting furnaces for all metals, or special lift-coil type furnaces for crucible melting of non-ferrous metals.

You'll find Ajax-Northrup furnaces ideal for all your close-analysis melting. Ideal also for many *heating* jobs in your plant. Just tell us what you want to do; we'll dig into our 34 years of experience and show you how.

AJAX ELECTROTHERMIC CORPORATION • Ajax Park, Trenton 5, N. J.

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AJAX ELECTRIC FURNACE CORPORATION
AJAX ELECTRIC COMPANY, INC.
AJAX ENGINEERING CORPORATION

AJAX NORTHRUP

HEATING & MELTING

122

You can cut down discards with

MOGUL

MAKES SMOOTHER CORES
CUTS DRYING TIME

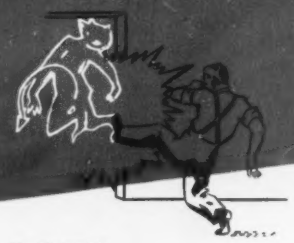
Full technical service, without obligation, is available to show how you can profit from the use of MOGUL® Cereal Binder in your production.

Write Technical Sales Department

CORN PRODUCTS REFINING COMPANY

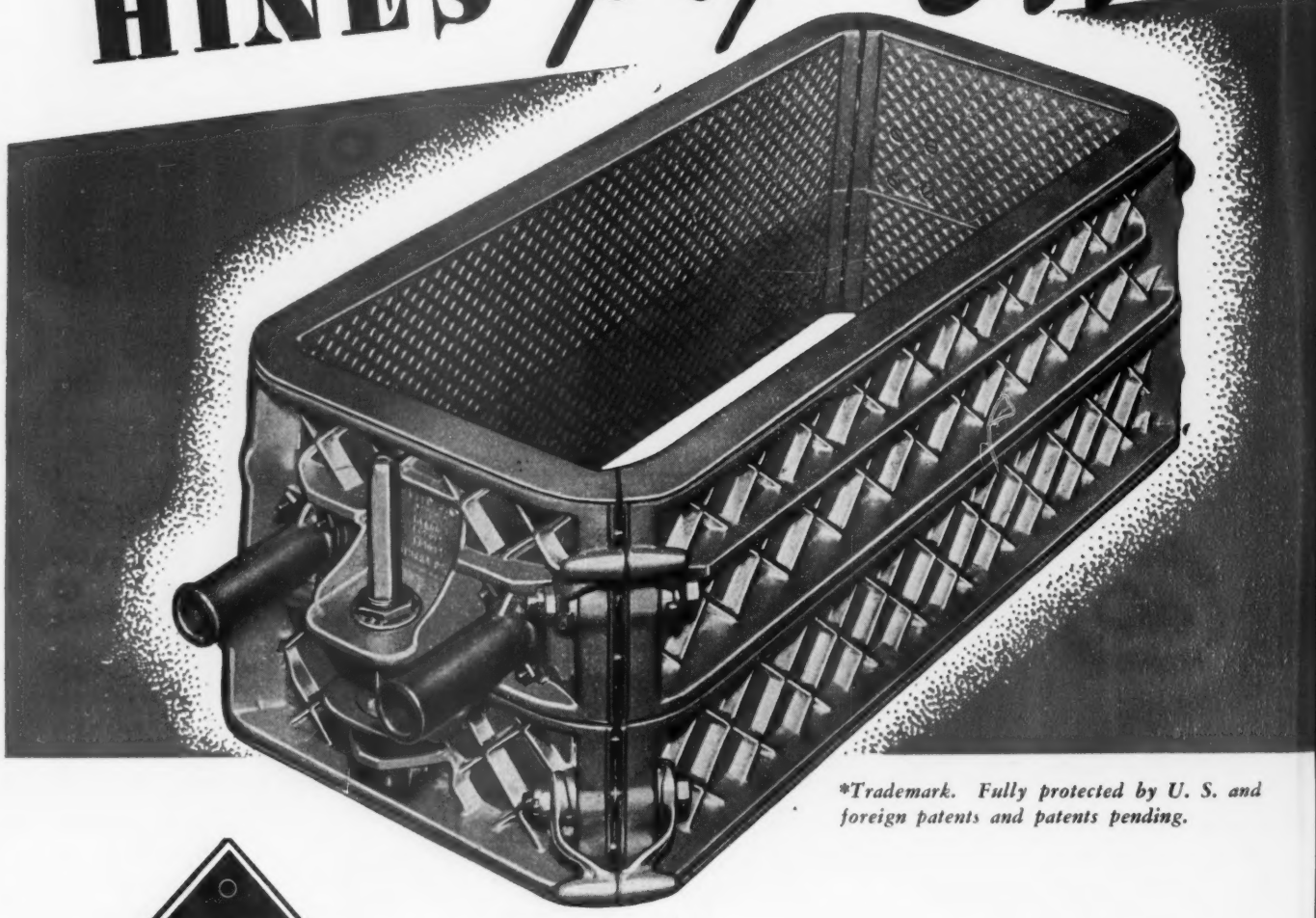
17 Battery Place • New York 4, N. Y.

the preferred dry bond for cores



Banish trouble with a POP-OFF*

HINES "Pop-Off"*



*Trademark. Fully protected by U. S. and foreign patents and patents pending.

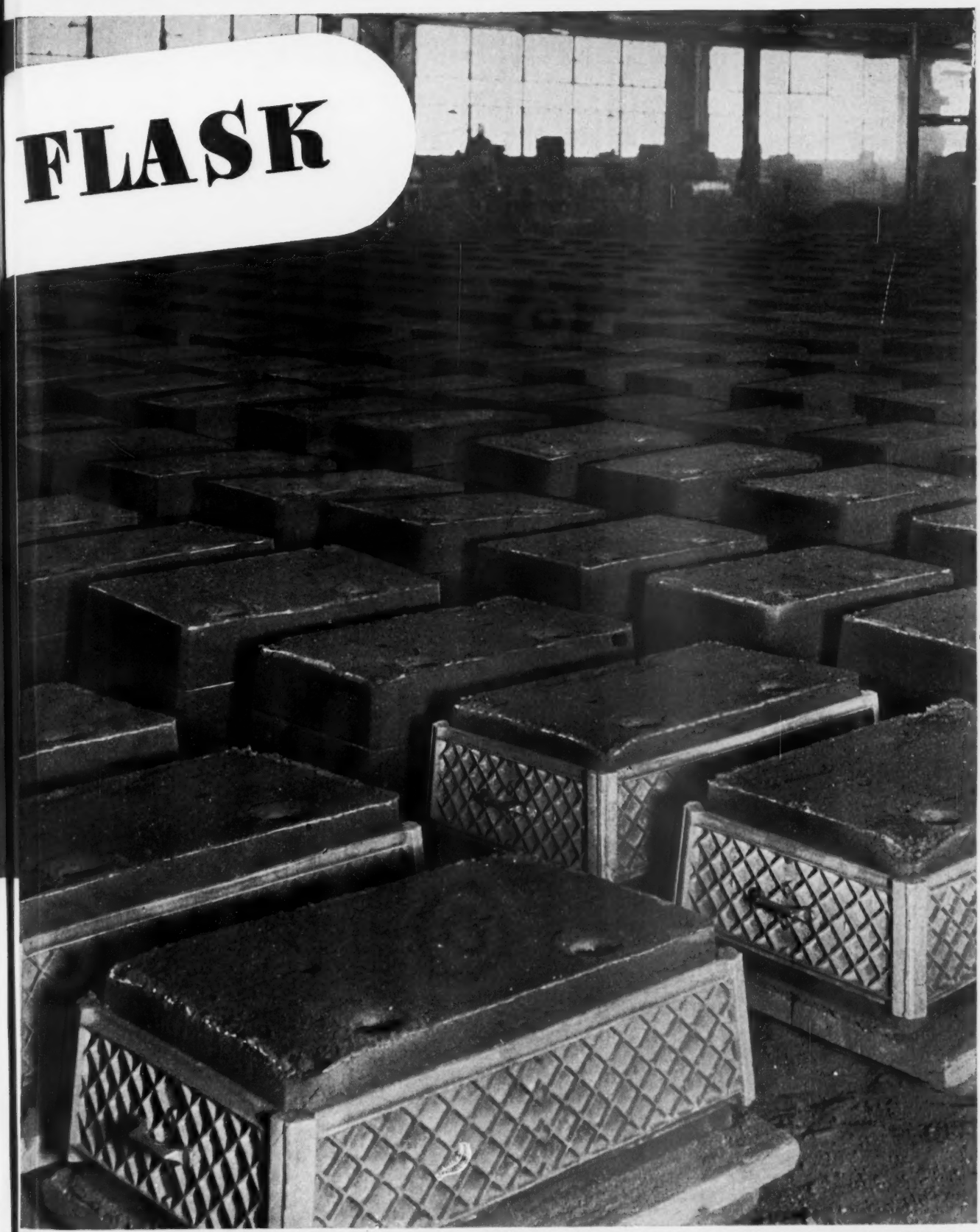
HINES POP-OFF (Trademark Reg. U. S. Pat. Off.) FLASK

It's easy to "see" the quality, sturdiness and expert workmanship in the Hines "Pop-Off" Flask shown above. But there are other important advantages that don't show in a photo . . . . advantages you should know about. If you're not thoroughly familiar with Hines "Pop-Off" Flasks, write for complete information.

EXCLUSIVE MANUFACTURERS OF FLASKS AND JACKETS

THE HINES

3431 WEST 140th STREET

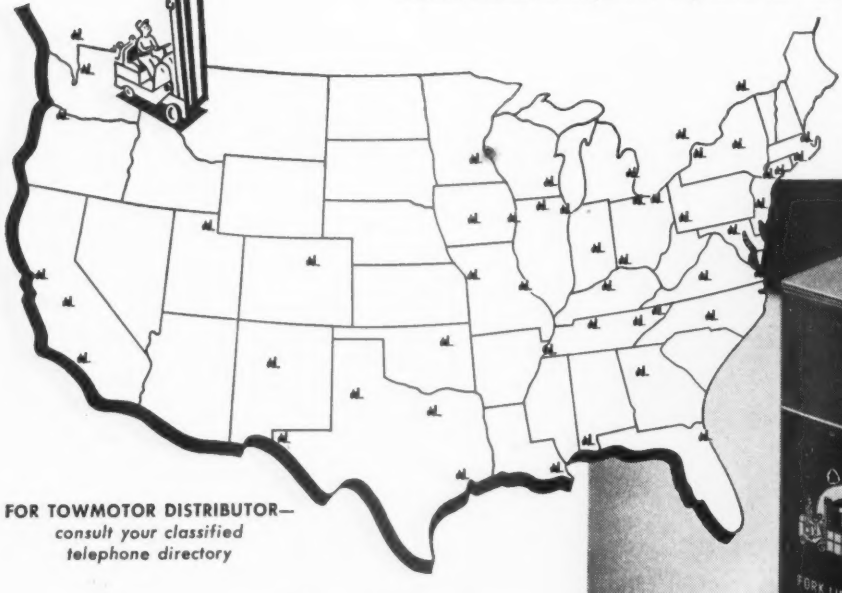


FLASK CO.

CLEVELAND 11. OHIO

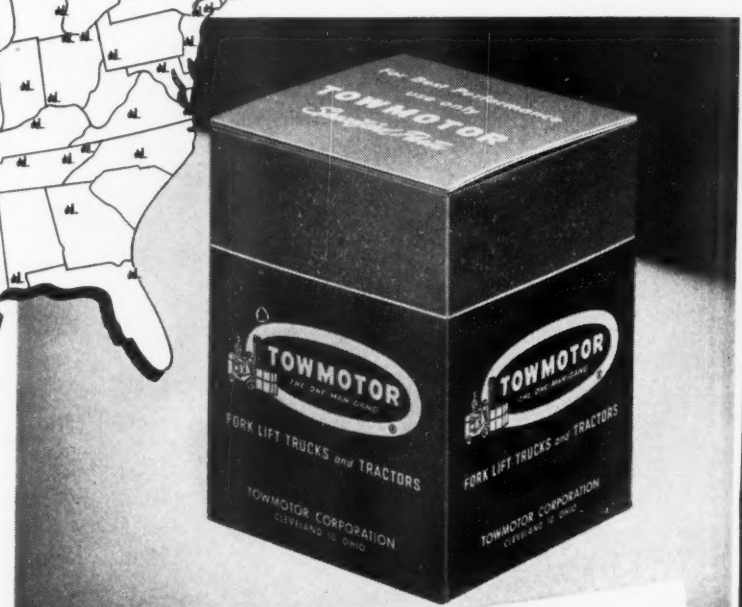
EVERYWHERE YOU LOOK TOWMOTOR REPLACEMENT PARTS ARE QUICKLY AVAILABLE

To make available man-power more productive and more efficient, Towmotor Fork Lift Trucks provide continuous, 'round-the-clock service on all handling jobs. However, even normal mechanical operations require occasional replacement parts to maintain top operating efficiency. To take care of your Towmotor requirements your Towmotor Representative carries a full line of GENUINE Towmotor-Specified Replacement Parts, *packaged* for quick identification, ease of handling and protection against damage. This service assures you of ready availability of any Towmotor part, and relieves you of the trouble and expense of maintaining a parts inventory. Your Towmotor Representative is equipped and ready to help you. TOWMOTOR CORPORATION, Div. 75, 1226 E. 152nd St., Cleveland 10, Ohio.



FOR TOWMOTOR DISTRIBUTOR—
consult your classified telephone directory

Genuine Towmotor-Specified Parts are easy to identify, easy to handle and are delivered to you in perfect condition in this specially designed package.



Towmotor Preventive Maintenance Service Eliminates Down Time!

Available through Towmotor Representatives, *Towmotor Preventive Maintenance Service* helps keep your Towmotor equipment up to maximum operating efficiency. Whether you have a single Towmotor or a fleet, skilled, factory-trained mechanics make regular inspections to assure extra years of profitable operation and trouble-free service. Towmotor Preventive Maintenance Inspections can be scheduled for periods when your Towmotors are not in service. Towmotor-Specified Replacement Parts guarantee top performance.

Write for full details regarding Towmotor Preventive Maintenance.

TOWMOTOR
THE ONE-MAN-GANG ®

FORK LIFT TRUCKS and TRACTORS

RECEIVING • STORAGE • PROCESSING • DISTRIBUTION

12 Models—A Towmotor for every job

HOW MANY PEOPLE HAVE YOU TALKED TO ABOUT AMERICANISM TODAY?

SHORT CUT TO LOWER CASTING COSTS

Another Foundry Finds Way To Speed Production, Conserve Metal

SEVEN MINUTES SAVED
Connecting rod at left was cast in "C" Process shell molds. Note smooth surface, minimum excess metal! Rod at right, cast in conventional sandbox mold, is rougher; takes 7 minutes longer to finish.

Using the Croning Process for making thin-shell sand molds bonded with BAKELITE Phenolic Resins, Builders Iron Foundry of Providence, R. I., *saves seven minutes* of finishing time on each of these "Meehanite" metal connecting rods –30 per cent faster than casting by usual sandbox methods. These dramatic savings stem from the "C" Process which yielded castings of exceptionally smooth surfaces, and to tolerances of .002 to .003 of an inch per inch.

For information about BAKELITE Phenolic Resins for the Croning Process, write Dept. CA-29.

Outstanding advantages of the "C" Process shell molds and cores.

- *Smooth surfaces with close tolerances*
- *Fast production of molds and cores*
- *Uniform quality, reducing rejects*
- *90 per cent less sand required*
- *For ferrous or non-ferrous metals*
- *Strong, moisture resistant, stable*
- *Can be stored for long periods*
- *Saves floor space*

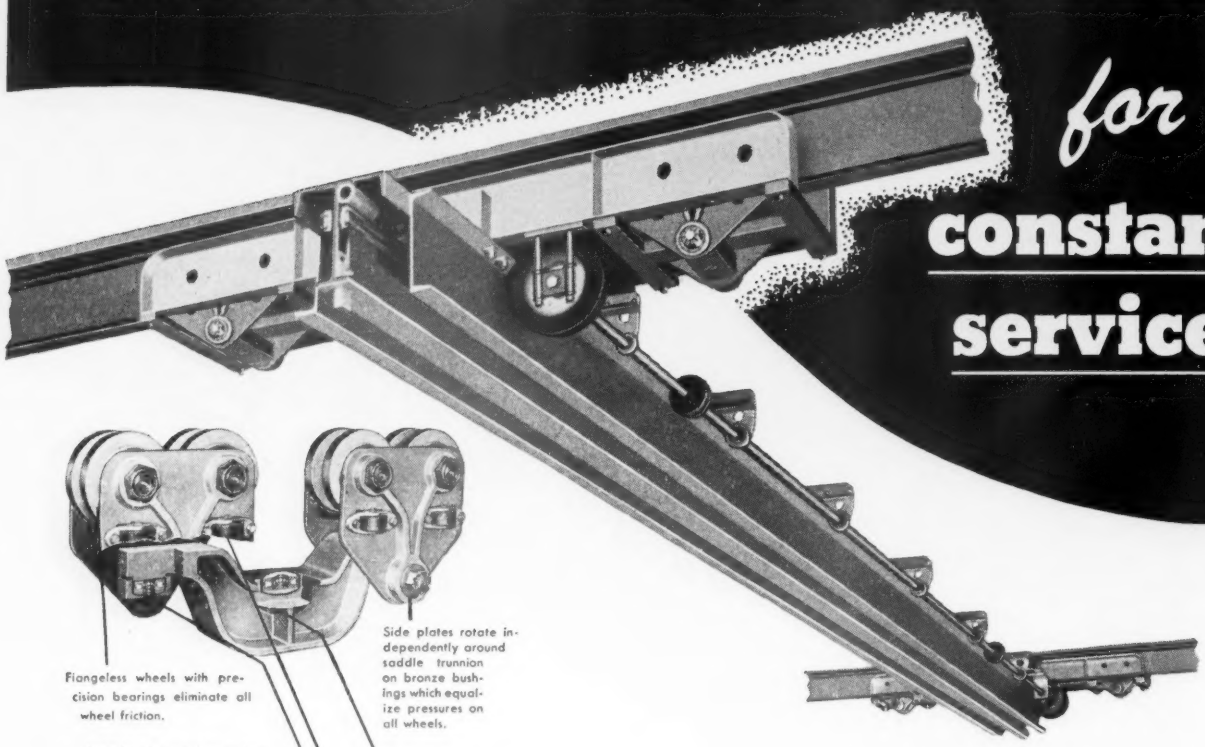
BAKELITE
TRADE-MARK
PHENOLIC
BONDING RESINS

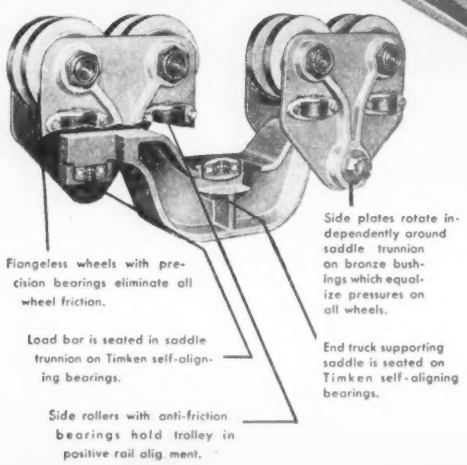
TRADE B MARK

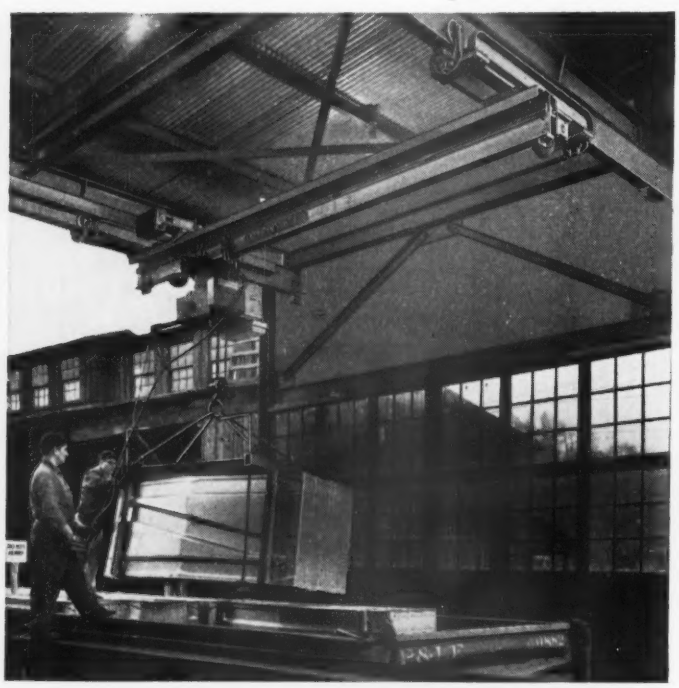
BAKELITE COMPANY
A Division of
Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N. Y.

AMERICAN MONORAIL CRANES

for **constant service**




Flangeless wheels with precision bearings eliminate all wheel friction.
Load bar is seated in saddle trunnion on Timken self-aligning bearings.
Side rollers with anti-friction bearings hold trolley in positive rail alignment.
Side plates rotate independently around saddle trunnion on bronze bushings which equalize pressures on all wheels.
End truck supporting saddle is seated on Timken self-aligning bearings.



Only two men are needed to transfer bundles from shipping rooms directly into gondola cars — a saving of 32 man-hours per shift over previous method. This crane is in constant service. The secret of its success is Articulated Trolleys.

When each trolley wheel carries its share of the load in perfect alignment with the craneway tracks and all possible friction is eliminated, the result is perfectly articulated trolley travel.

Applied to American MonoRail Cranes, these articulated trolleys permit constant operation—handling loads up to 10 tons. And with this is offered all the flexibility of MonoRail design for interlocking carrier service between and beyond the craneways.

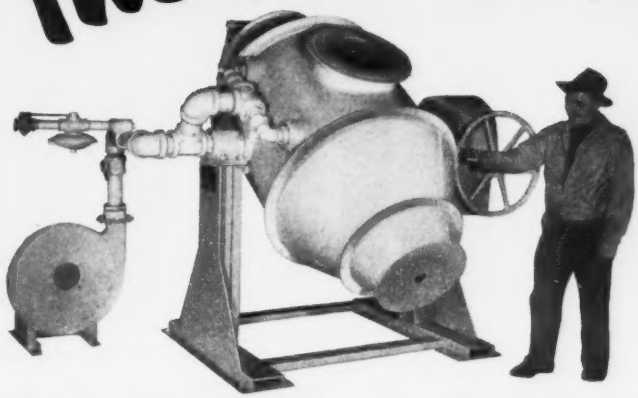
Let an American MonoRail engineer explain all the advantages of these new cranes, or write for complete information.

THE AMERICAN MONORAIL COMPANY

13104 ATHENS AVENUE **CLEVELAND 7, OHIO**

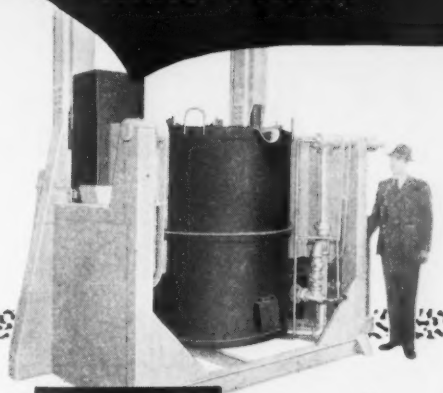
The Foremost Furnaces

for Melting any type of Non-Ferrous Metals in Foundries, Die Casting and Permanent Mold Plants



STROMAN MODEL "BFC" HAND TILT BARREL TYPE MELTING FURNACE FOR ALUMINUM

Featuring "Tangential Firing" which produces a most efficient combustion condition, creating a melting atmosphere that keeps metal loss and dross accumulation at a minimum. Charges through the top or rear door which is also used for drossing metal and cleaning the furnace. Built in 500 lb. capacity and larger. Oil or gas fire.

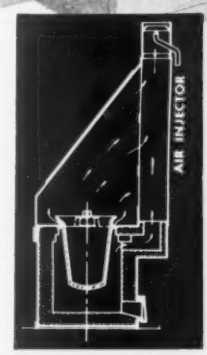


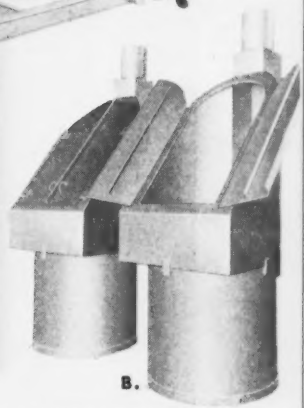
A.

STROMAN MAGNESIUM AND ALUMINUM MELTING AND HOLDING FURNACES

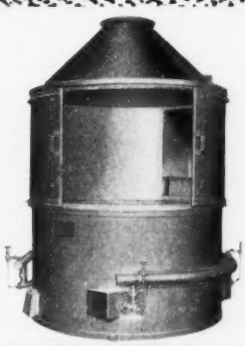
A. Hydraulic Tilt Magnesium and Aluminum melting furnace handling from 500 to 3000 lbs. of aluminum. Incorporates the famous Stroman Stationary Lip Pour, which creates a constant pouring arc at any desired pouring speed. Saves time and metal.

B. Stationary Super-Heating or Melting Furnaces, Type S. F. Designed to deliver the correct super-heat to magnesium after it has been melted in larger furnaces, and before it is poured into the molds. Can also be used for breakdown or holding. They have all safety features. Are available for cast steel pots or fabricated steel pots. Furnaces may be equipped with hoods if so desired, for the venting of combustion and other gasses. Write for bulletin No. 100.





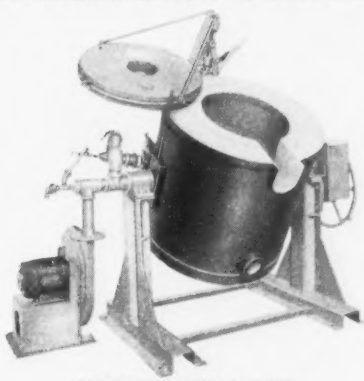
B.



STROMAN IRON POT MELTING FURNACES FOR ZINC OR ALUMINUM

These furnaces are highly recommended as breakdown furnaces for zinc and aluminum die casting and permanent mold plants. They also excel as holding furnaces. They can be supplied either with or without hoods to exhaust fumes and heat. Their construction causes longest pot life and lowest fuel costs. Choice of automatic or manual controls and oil or gas fire. Capacities from 212 to 14,000 lbs. zinc.

Write for Bulletin No. 115



STROMAN HAND TILT CRUCIBLE MELTING FURNACE FOR BRASS, BRONZE, ALUMINUM AND OTHER ALLOYS

Capacities from No. 40 to No. 500 Crucible. Most efficient in operation. Rugged construction assures longest life and trouble-free operation. Oil, Gas or Combination Fire.

Write for Bulletin No. 105

STROMAN TYPE "MC" ALUMINUM DIP-OUT REVERBERATORY FURNACE

Bath capacity from 500 to 10,000 lbs. Aluminum

A combination of breakdown and holding furnaces makes this the most economical furnace ever designed for aluminum melting. It can be used for melting, holding, alloying, fluxing, for either casting or producing ingots. Cold metal does not reach the molten bath. Hot metal is always available for dipping. No iron pots or crucibles to buy. Oil, gas or combination oil-gas fire. Complete automatic controls are available if desired.

WRITE FOR COMPLETE CATALOGUE ON ALL TYPES OF FOUNDRY EQUIPMENT

STROMAN FURNACE & ENGINEERING CO.

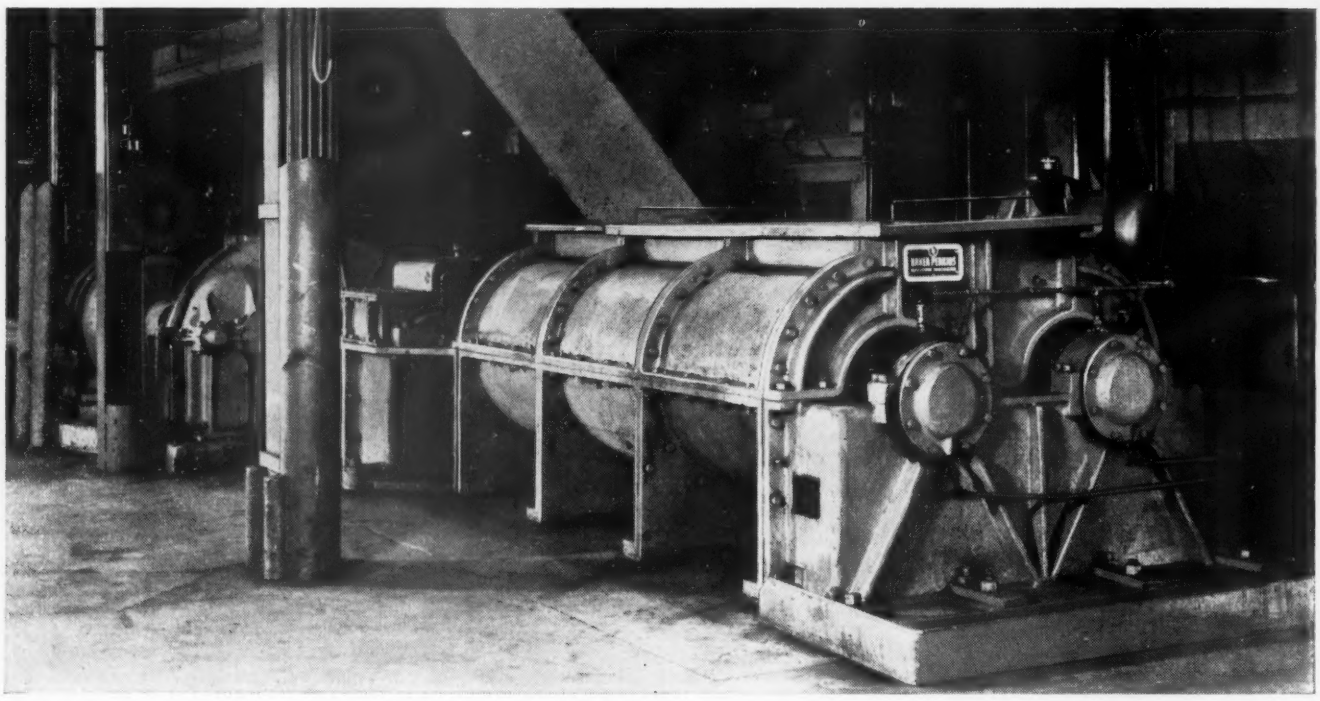
DIVISION OF

THE PETERSEN OVEN CO. • 9900 FRANKLIN AVE. • FRANKLIN PARK, ILL.

17,280 TONS

OF MOLDING SAND PER 3-SHIFT DAY

processed by Baker Perkins mullers in world's biggest grey iron foundry



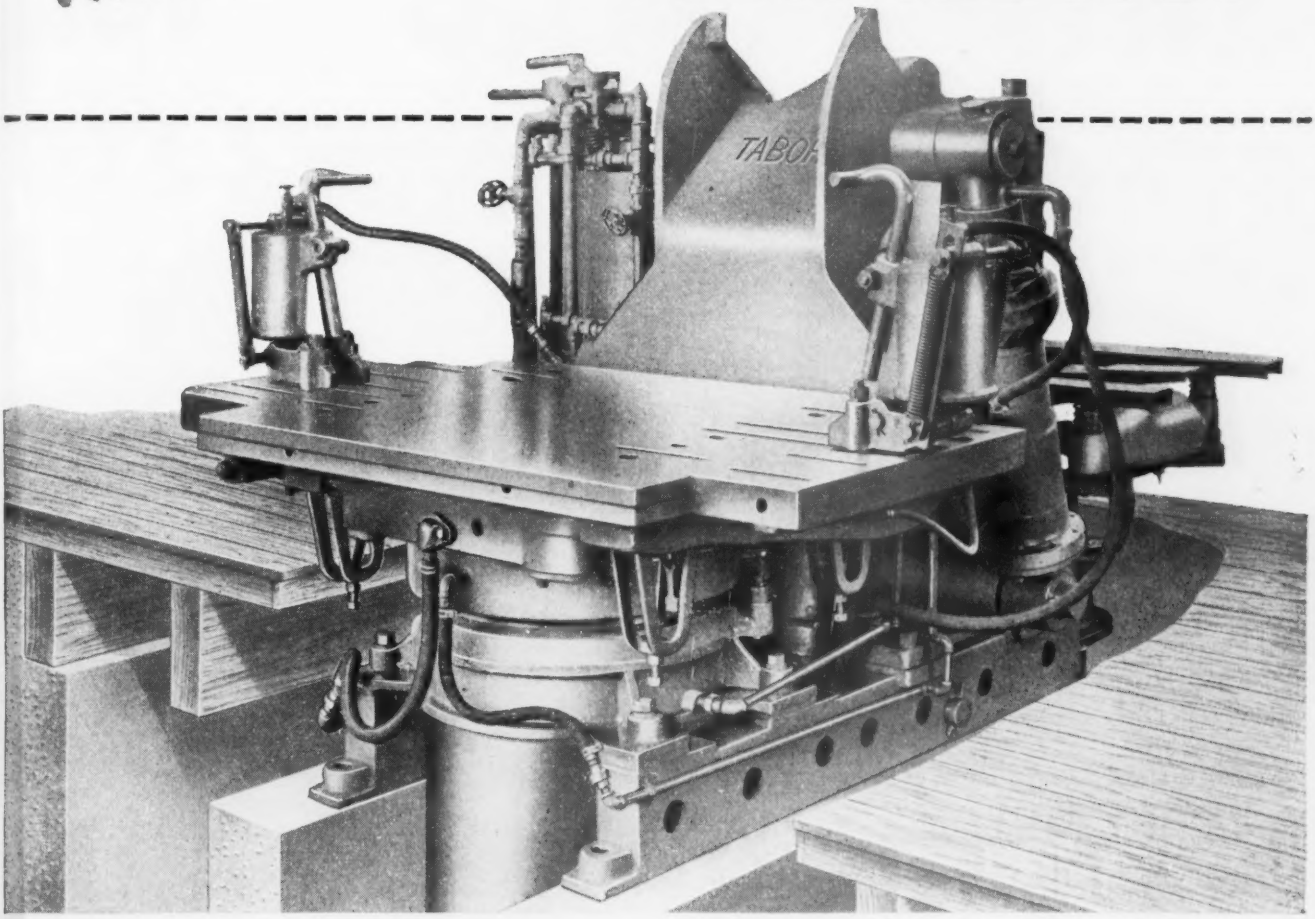
Six Baker Perkins Continuous Mullers are on the job at the world's biggest grey iron foundry helping to meet tough, tight schedules that depend on high daily production. Each B-P 5A Muller is conditioning 120 tons of molding sand each hour during an 8-hour shift. In the course of a 3-shift day, the six B-P Mullers handle the staggering total of 17,280 tons of sand that comes to the molding lines thoroughly mixed and tempered. Baker Perkins Continuous Mixers are ideal for processing molding sand on a big scale. Unique blade arrangement in B-P Mullers thoroughly mulls and aerates the tumbling sand mass, and each grain of sand is correctly coated with bond. B-P Mullers will deliver an uninterrupted flow of 30 to 120 tons of good sand per hour depending upon the size unit. Baker Perkins Continuous Mullers produce improved sands that mean better castings and lower scrap loss. They dependably meet the demands of high production automotive foundries and they can do the same for you. Write, wire, or phone for the full story on Baker Perkins Continuous Mullers.

BAKER PERKINS INC.

SAGINAW, MICHIGAN

189

There's A TABOR ROLLOVER TO FIT THE JOB!



PICTURED is only one of Tabor's large and diversified family of foundry-proved Rollovers. This one's a 3,000-lb. capacity, *shockless* job. The rollover plate is 40" wide x 50" long. When air-operated flask clamps are used (as shown), it handles pattern boards ranging in length from 24" to 56". Even with modest pit requirements, the plate is only 15" above floor level for easy workability. Accommodates a 43" deep flask (including pattern board and bottom boards)—minus the draw required. Maximum draw on the unit shown is 15". With modifications we can provide for a 55" flask depth on the basis outlined above, and a 20" draw.

Tabor Power Rollovers run the gamut of size and type. They range from 450-lb. to 3,000-lb. capacity. All are *completely* power-operated and can be furnished with air-operated flask clamps. You can choose between plain or shockless jar, and some types are portable. All incorporate Tabor's famous air-on-oil principle for a perfect draw. All perform up to full rated capacity, completing a cycle of operations in the fractional part of a minute.

Complete Rollover family is presented in Bulletin #494—just off press. Write for your copy. Then team up with Tabor for a quick and satisfactory solution to any Rollover problem.

REPRESENTATIVES
Snyder Foundry Supply Company, Los Angeles Calif.; The Pacific Graphite Company, Inc., 40th & Linden Sts., Oakland 8, Calif.; Carl F. Miller & Company, Seattle, Washington; E. R. Frost Company, Inc., Minneapolis 14, Minn.; Harry H. Reich, Trussville, Ala.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

The TABOR Manufacturing Co.

SINCE 1884 MANUFACTURERS OF FOUNDRY MOLDING MACHINES
6225 TACONY STREET • PHILADELPHIA 35, PENNA.

EXPORT DEPARTMENT, 765 DREXEL BLDG., PHILA. 6, PA.

the magnet that answers THE NEED

Dings New Improved Lifting Magnet . . . Weighs Less, Lifts More, and Lasts Longer

THIS latest Dings magnet has *all* the features necessary for maximum scrap yard performance. A few examples . . .

WELDED STEEL CONSTRUCTION—eliminates the moisture danger, makes a strong rigid magnet that can take the hard blows.

LIGHTER WEIGHT—*More* of the weight your crane is carrying will be payload. A balanced magnetic circuit of advanced design makes this difference.

MAXIMUM POWER, LONGER—No. 1 reason for this is less heat rise due to the improved magnetic circuit. In addition, a new, finer insulating compound dissipates strength-sapping heat, prevents electrical leakage between coil wires.

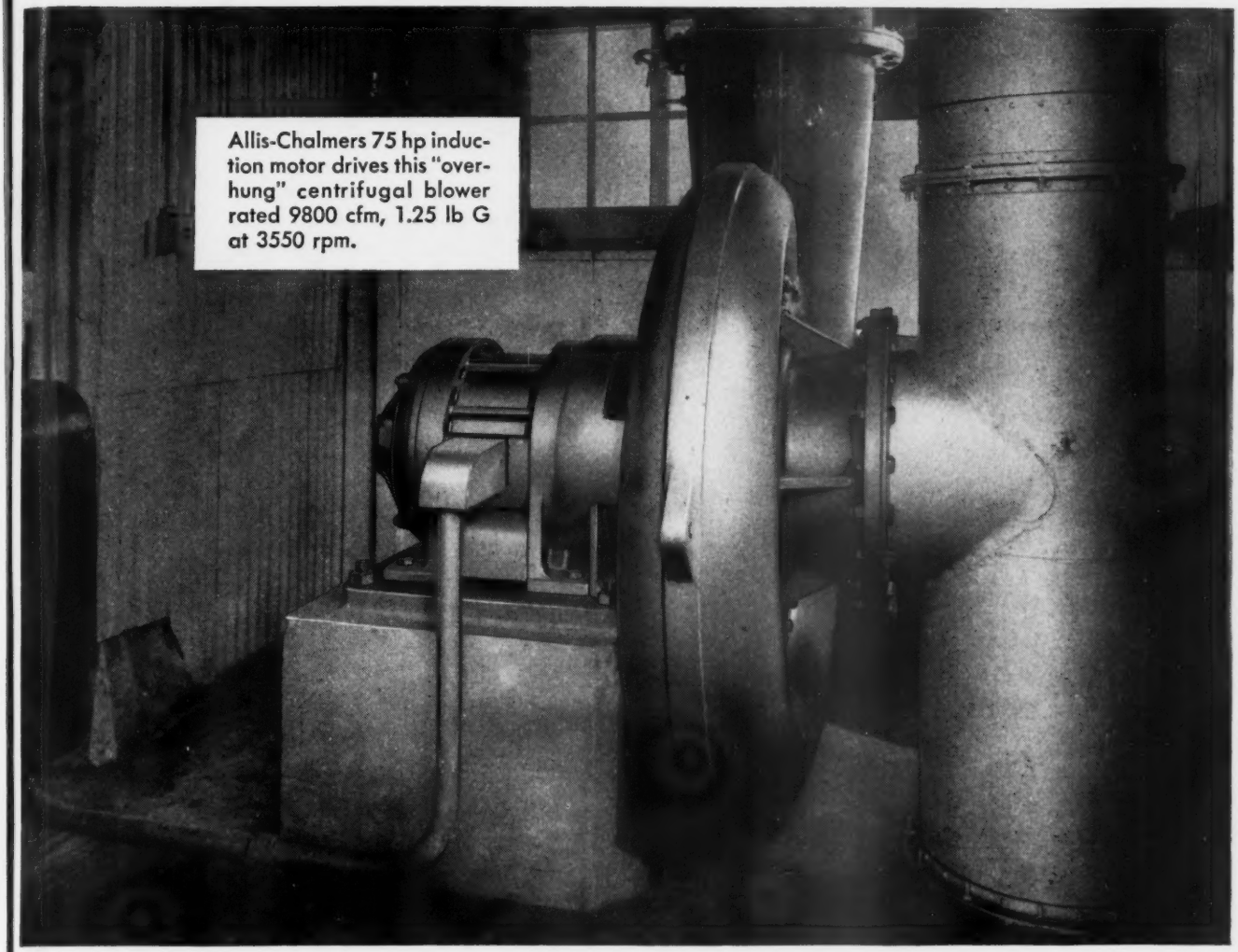
Those are the *big* new features. There are a dozen other important ones you'll be interested in.

FOR FULL DETAILS, WRITE for the LIFTING MAGNET CATALOG.

DINGS MAGNETIC SEPARATOR CO.

4708 W. Electric Ave., Milwaukee 46, Wis.

Dings Certified MAGNETIC STRENGTH



Allis-Chalmers 75 hp induction motor drives this "overhung" centrifugal blower rated 9800 cfm, 1.25 lb G at 3550 rpm.

14 Years at Hard Labor!

TALK ABOUT RELIABILITY, this foundry cupola blower has run continually for 14 years — 11 years consecutively with no repair whatsoever! Installed in 1937 at the repair shop of a large western railroad, this centrifugal blower operated steadily and with only routine maintenance until 1948. The anti-friction bearings then were replaced and the blower has remained in repair-free operation since.

This blower-drive-motor control "team" — all Allis-Chalmers — supplies the desired amount of air for the operation of a foundry cupola. And this blower's performance is vital since the maintenance of rail transportation depends upon the fast availability of grey iron repair parts.

This kind of reliable performance is not at all unusual for Allis-Chalmers centrifugal blowers, even in foundry service. The cast iron casing reduces vibration, lowers noise level, and gives long life impossible with fabricated construction. The one moving part, the impeller, is "overhung" on the motor shaft and supported by long-lived anti-friction bearings. As seen in the photo above, the entire installation is compact and readily accessible.

If *you* want this kind of performance and convenience in *your* foundry, specify A-C blowers for cupola installations and replacements. For complete information call your nearest A-C sales office or write to Allis-Chalmers, Milwaukee 1, Wis. for Bulletin 16B6048A.

A-3302

ALLIS-CHALMERS

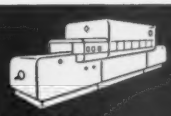
A-C ALLIS-CHALMERS

Foundromatic and Regulex are Allis-Chalmers trademarks.

Foundry Equipment for Bigger Output-Better Working Conditions!

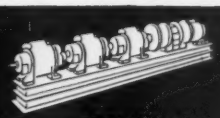
FOUNDROMATIC SHAKEOUTS

MOTORS-DRIVES-CONTROL



FOUNDROMATIC CORE DRYER

INDUCTION HEATING & MELTING



REGULEX ARC FURNACE CONTROL

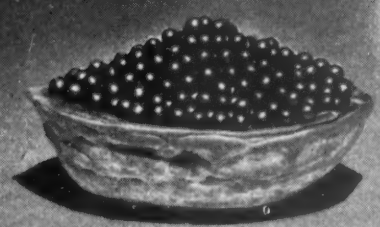
HERE'S YOUR ANSWER

to faster, better, uniform, low-cost blast cleaning

IN A NUTSHELL

METALLIC

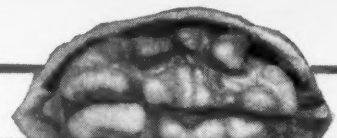
SHOT **HI-GRADE** GRIT



That's a broad claim. We don't expect you to accept it without substantiation. We hope you will ask us to present our proof. All we ask, is that you let it be on-*your*-job proof. Proof we know you'll believe! The only proof we want you to accept.

Like many production finishing men, perhaps you have always taken shot and grit pretty much for granted. If so, you have a surprise coming, for Hi-Grade Shot and Grit IS different—so superior, in so many ways—you can only appreciate its true value by job-testing the material yourself. That way you get proof of performance you can accept as conclusive. Order a trial quantity today. We'll let results speak for themselves. You'll find they say, "*Hi-Grade is best by test*"—your answer to faster, better, uniform, low-cost blast cleaning, in a nutshell.

Packed in 100 lb. Bags—Ready For Immediate Shipment



YOU GET TO THE MEAT OF HARD-TO-CRACK BLAST CLEANING PROBLEMS FASTER WITH

HI-GRADE SHOT AND GRIT

- **YOU GET MORE EFFICIENT PEENING AND CLEANING.** Hi-Grade Shot and Grit is uniform, especially processed to withstand repeated strain, stress and wear.
- **YOU GET MORE FOR YOUR BLAST CLEANING DOLLAR—LESS WASTE.** Hi-Grade Shot is famous for its lack of hollows, tails and irregular shapes which do no good, yet cost money. Hi-Grade Grit is free from dust fines and scale. This alone, saves you up to 20% in actual cost *before you even use Hi-Grade Shot and Grit.*
- **YOU GET A LOWERED COST PER TON OF CASTINGS CLEANED** because Hi-Grade Shot and Grit has a longer re-use value. Special alloying and tempering process minimizes impact fractures.

HI-GRADE SHOT AND GRIT MORE THAN MEETS S.A.E. SPECIFICATIONS—SCREENED AND GRADED FOR 100% USAGE

Clayton-Sherman *Abrasives Company*

MANUFACTURERS OF *QUALITY-CONTROLLED* SHOT AND GRIT

Representatives in Principal Cities

3896 LONYO ROAD ★ DETROIT 10, MICHIGAN

Hough scores again with still another new PAYLOADER. This model HAH, like all other PAYLOADERS, is a complete Hough-designed-and-built tractor and shovel with the same outstanding features and advantages that have established PAYLOADERS as first choice in industry for handling bulk materials.

This fast-travelling, short-turning unit can scoop-up a ton of materials and carry it fast over floors or ground, through narrow aisles and up ramps. Precise hydraulic dump control deposits the loads carefully or abruptly at any height up to 91 inches. The Model HAH will also stockpile and windrow materials . . . will lift, lower, and push. It can be depended on to do hard work on a 24-hour-a-day basis and to handle many bulk material moving jobs, with great savings in time, labor and costs.

It has everything in design, efficiency and stamina for which PAYLOADERS are famous and is sold and serviced by Hough Distributors world-wide.

The Frank G. Hough Company, 703 Sunnyside Avenue, Libertyville, Illinois.

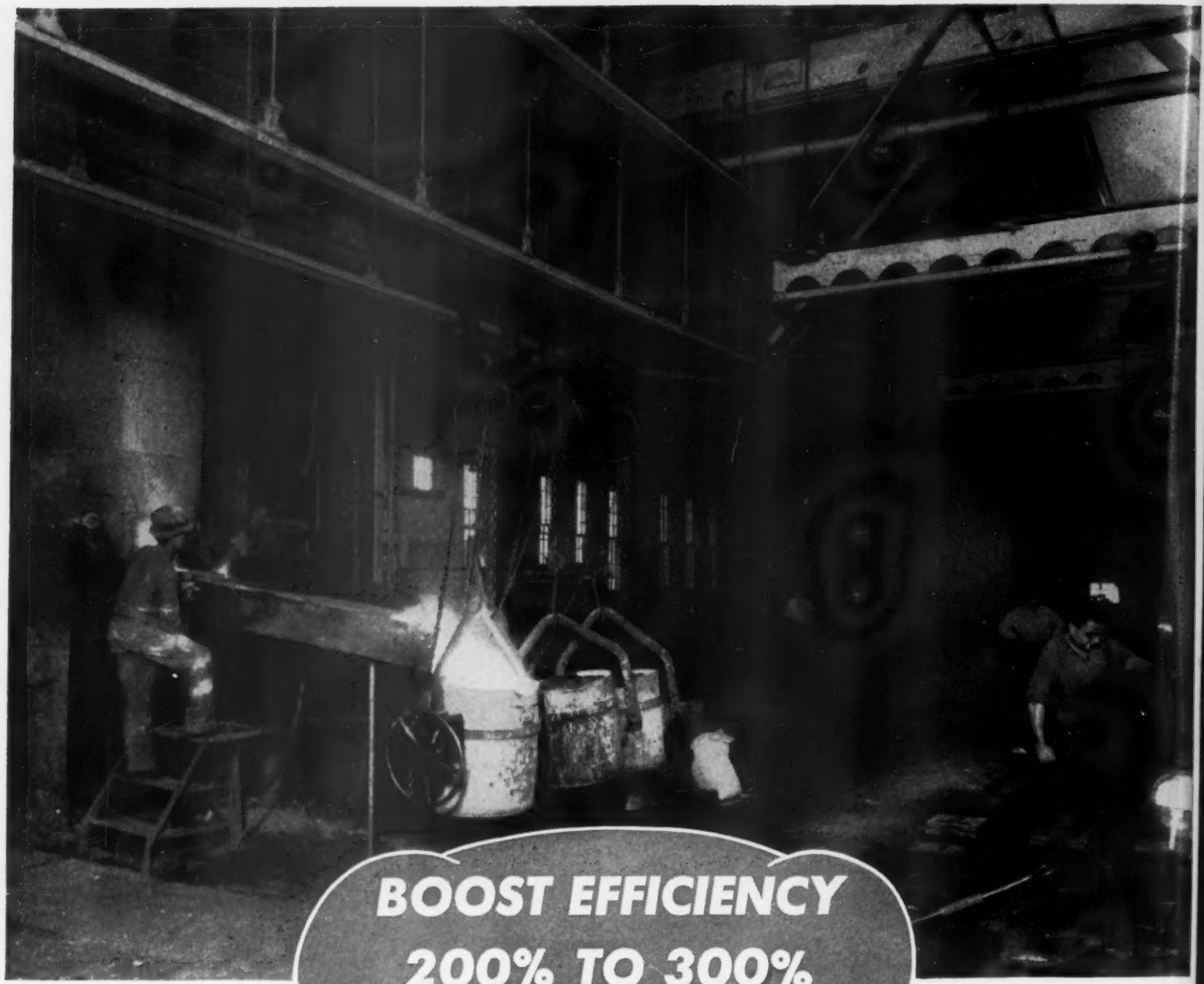
- Four forward and four *faster* reverse speeds up to 23 mph.
- Separate quick-acting forward-reverse shift.
- Full hydraulic control of bucket — lift, dump, close, lower.
- Automatic quick tip-back of bucket.
- Compact, stable and maneuverable.
- Fullest operator visibility.
- Large pneumatic tires.

WRITE for information on the Model HAH or other PAYLOADERS from 12 cu. ft. to 1½ cu. yd. capacity. Also ask for your copy of "Industrial Handling" the magazine of PAYLOADER uses.

SAY "HUFF"

PAYLOADER®

THE FRANK G. HOUGH CO. • Since 1920



BOOST EFFICIENCY 200% TO 300% THE TRAMRAIL WAY

THE scene of men scurrying back and forth hurriedly with small hand ladles of hot metal changes with the installation of Cleveland Tramrail equipment, to one of calm movement, with all steps carefully planned and coordinated to achieve maximum results with least effort.

More metal is handled at a time because hand carrying is eliminated and larger pouring ladles riding on overhead tramrail track are used.

Delivery time of metal from cupola to molds is cut considerably. This means less heat loss.

Efficiency is stepped up tremendously, often 200 to 300 per cent. Safety is improved and workers are less tired at the end of a day.

GET THIS BOOK!
BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
3828 EAST 286th ST., WICKLIFFE, OHIO

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

How To Get Easier Parting, Smoother Castings, Less Smoke

Use **"dag"** colloidal graphite dispersions to coat chills, molds, patterns, cores, push pins, shoulder screws, flask pins . . . even to coat ladle interiors.

An application of colloidal graphite will produce an unusually slippery dry film because of its peculiar arrangement of atoms. It is virtually unaffected by heat . . . . up to 5000° F. in inert atmospheres . . . and is so thin that critical casting tolerances are not affected at all.

Patterns, dies, and molds treated with **"dag"** colloidal graphite give superior reproduction and smoother casting surfaces. Less finishing is required; rejects are fewer; mold life is lengthened.

"Dag" water dispersions also eliminate or reduce the choking fumes and smoke usually caused by conventional petroleum-base parting compounds, thus improving shop conditions.

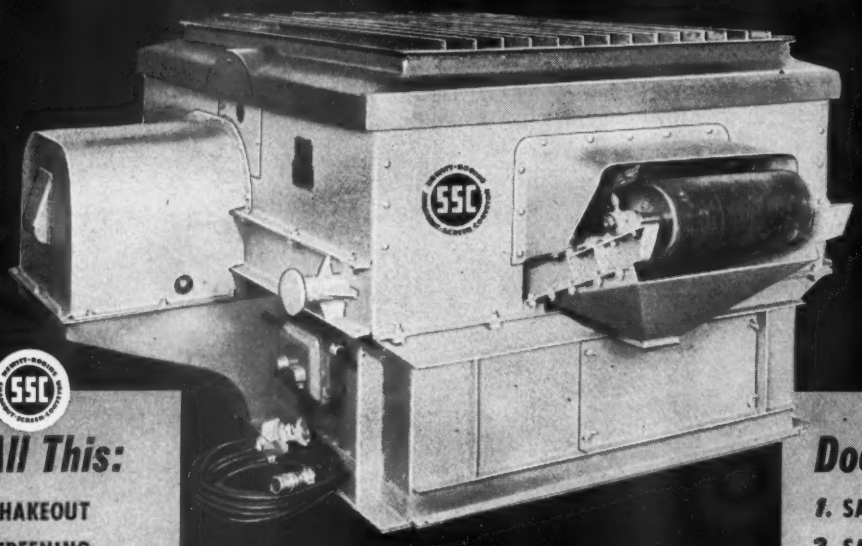
The new and complete bulletin "Use of Colloidal Graphite in the Foundry" is yours for the asking. Write today for Bulletin # 425-14E.

dag DISPERSIONS®

Acheson Colloids Corporation, Port Huron, Michigan

. . . also Acheson Colloids Limited, London, England

Now... FIVE FOUNDRY OPERATIONS WITH ONE PIECE OF EQUIPMENT!



Does All This:

1. FLASK SHAKEOUT
2. SAND SCREENING
3. LUMP BREAKING
4. CONVEYOR FEEDING
5. TRAMP METAL TRAPPING

Does All This:

1. SAVES TIME!
2. SAVES SPACE!
3. SAVES MONEY!
4. SAVES POWER!
5. SAVES MAINTENANCE!

Now You Can Mechanize for Complete Sand Reclamation with One Hewitt-Robins SSC Unit!

Think of it! A Shakeout . . . a Sand Screen . . . a Lump Breaker . . . a Feeder Belt Conveyor and a Tramp Metal Trap —all in one compact, self-contained, portable unit taking up no more space than a standard portable foundry shakeout. That's exactly what you get in the new Hewitt-Robins SSC unit. With it, your entire shakeout and sand handling operation is completed in a matter of minutes . . . more thoroughly, more economically, more efficiently than ever before! Here's what it does:

FLASK SHAKEOUT. The loaded flask goes on the deck of a time-tested Robins Floatex® Shakeout. Castings, risers, gaggers, etc., are quickly released for easy removal from the deck.

SAND SCREENING. Sand passes through an integral hopper onto a screening deck equipped with non-blind cloth. This deck is actuated by the shakeout vibrator; no extra motor or other equipment needed. (Here sand receives the second of *three* aerations during reclaiming.)

LUMP BREAKING. Loose sand falls through the non-blind cloth and passes under a self-activating lump breaker. Any small sand supporters still present are automatically discharged.

CONVEYOR FEEDING. After passing through the screening deck, the sand falls onto a Hewitt-Robins Belt Conveyor with a Maltese Cross® Fiberglas Belt capable of withstanding 350°F. Conveyor delivers sand directly into your conditioner or to any other means of delivering elsewhere.

TRAMP METAL TRAPPING. Metal particles small enough to pass through the shakeout deck and the screening surface are trapped by the permanently magnetized head pulley on the conveyor, and fall into a tote box or other receptacle placed beneath it.

The SSC Unit saves time; it's fast, completely automatic. It saves space; does five operations in one compact unit! It saves money; no costly screen to buy. It saves power; requires only 8¼ H. P. It saves maintenance; fewer parts to service or replace. It will be the greatest low-cost producer in your entire plant! Write for Bulletin 136, giving complete details, to Robins Conveyors Division, Passaic, N. J.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

HEWITT-ROBINS

SSC UNIT

HEWITT-ROBINS HR INCORPORATED

BELT CONVEYORS *(belting and machinery)* • BELT AND BUCKET ELEVATORS • CAR SHAKEOUTS • DEWATERIZERS • FEEDERS • FOAM RUBBER PRODUCTS • FOUNDRY SHAKEOUTS • INDUSTRIAL HOSE • MINE CONVEYORS • MOLDED RUBBER GOODS • RUBBERLOKT ROTARY WIRE BRUSHES • SCREEN CLOTH • SKIP HOISTS • STACKERS • TRANSMISSION BELTING • VIBRATING CONVEYORS, FEEDERS AND SCREENS

easy-to-handle ROTOR CHIPPERS

"PAID OFF" in 45 days

JOB: Removing fins from press frame casting. Former chippers weighed 13½ lbs...were slow-hitting, hard to handle.

SOLUTION: Rotor Application Engineer recommended new Model C-15H Chippers. Weigh only 11½ lbs. Have plenty of high-speed sock.

RESULTS: Stepped up production 65%. "Paid off" new Rotor Chippers in 45 days.

Unusual? Not at all! We will gladly survey your plant for similar benefits. Why not call us in?

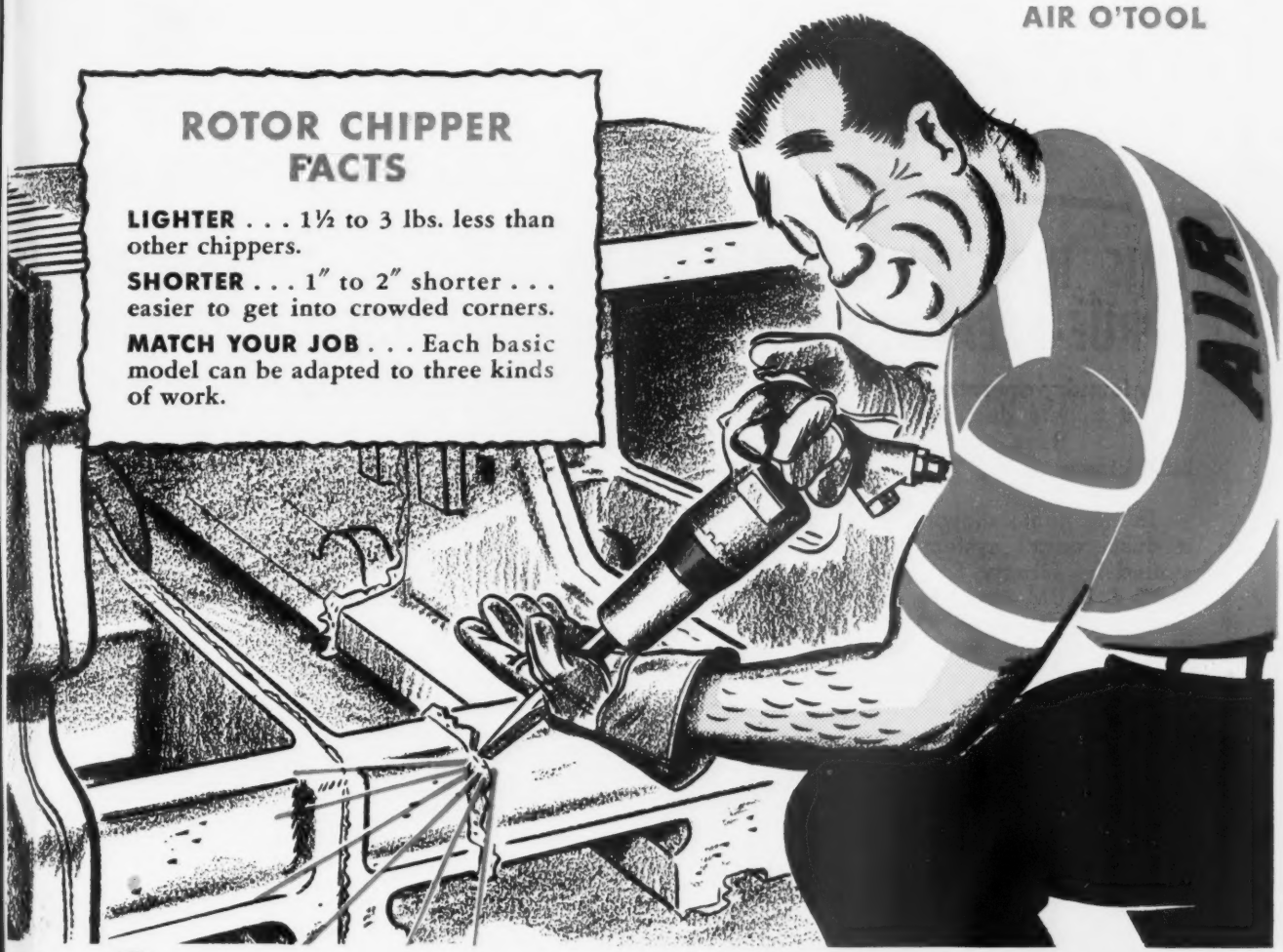
AIR O'TOOL

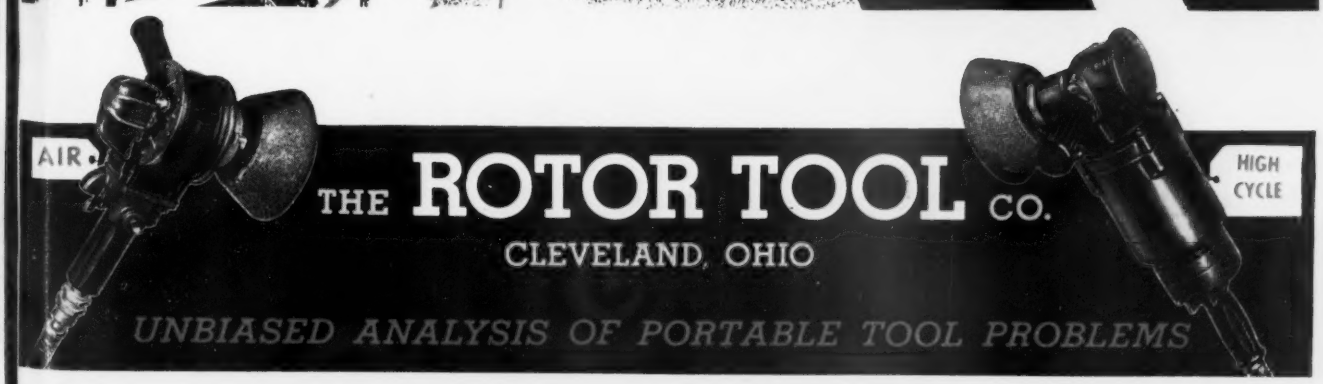
ROTOR CHIPPER FACTS

LIGHTER . . . 1½ to 3 lbs. less than other chippers.

SHORTER . . . 1″ to 2″ shorter . . . easier to get into crowded corners.

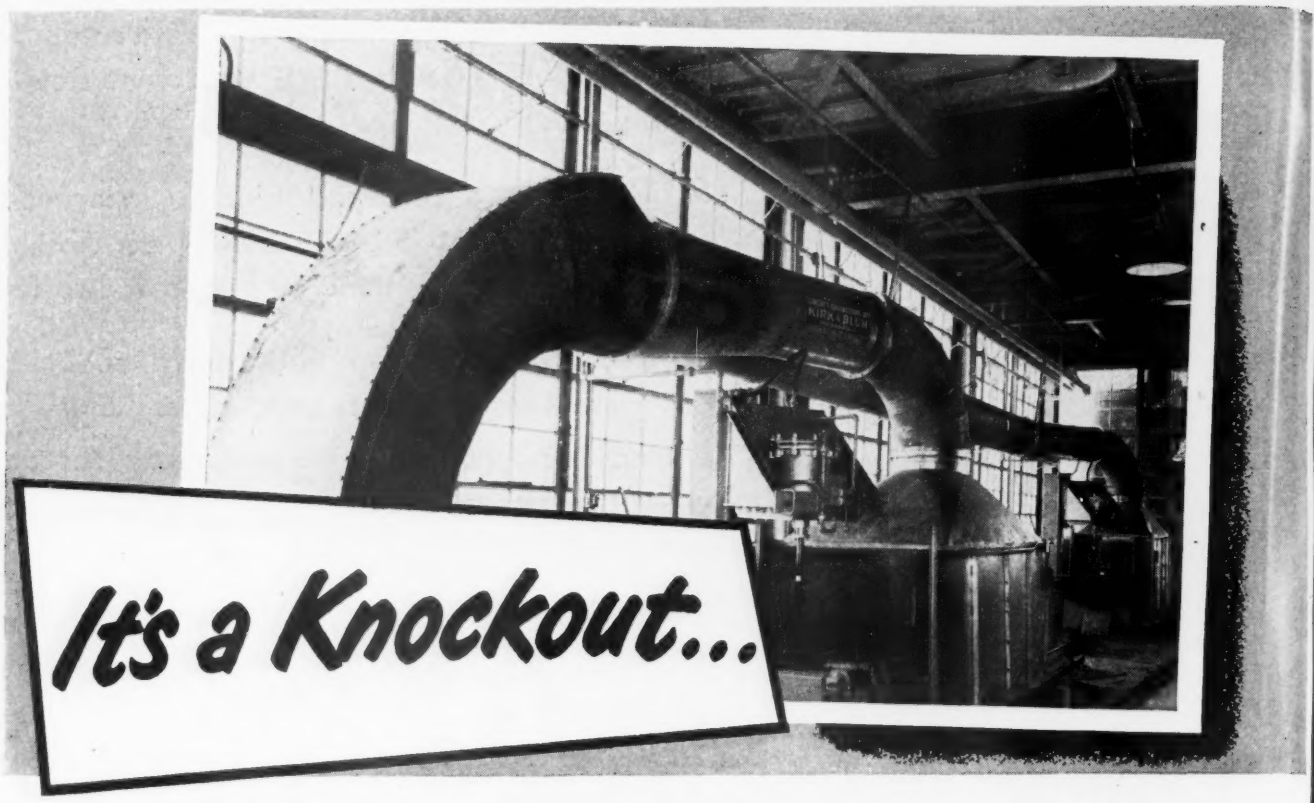
MATCH YOUR JOB . . . Each basic model can be adapted to three kinds of work.





THE ROTOR TOOL CO.
CLEVELAND, OHIO

UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS



It's a Knockout...

THIS KIRK AND BLUM DUST CONTROL SYSTEM ON SPRUE-BREAKING AND CORE KNOCK-OUT OPERATIONS

● In foundry operations . . . wherever you'd expect to find dust, smoke and fumes and *don't* . . . there you'll likely find a KIRK & BLUM installation.

In the photo shown above, for example, a dust control system fabricated and installed by Liberty Engineering, Division of KIRK & BLUM virtually eliminates dust. Of particular interest is the "flat-back" elbow. The curved plate shown is easily replaced or may be lined with abrasion-resistant material to meet severe conditions.

The photograph below shows the molding line, hoppers and supports which were also fabricated and installed by the Liberty Engineering Division. Other KIRK & BLUM systems are found in this same well known manufacturer's plant.

Whatever your foundry dust, fume or smoke problem . . . sand handling, pouring station ventilation . . . mold cooling, shakeouts, grinding and snagging or others . . . KIRK & BLUM Engineers have the experience needed to offer the logical solution, for truly efficient dust control.

Fabricated and Installed by Liberty Engineering Div. The Kirk & Blum Mfg. Co., Indianapolis, Ind.

For detailed information and literature write
The Kirk & Blum Mfg. Co.
3108 Forrer St. Cincinnati 9, Ohio

FOR CLEAN AIR . . . THE INVISIBLE TOOL

KIRK AND BLUM

DUST CONTROL SYSTEMS

DELTA 96·B SAND RELEASE AGENT . . .

Another Foundry "First"...by DELTA

MAKES SAND FLOW FREELY

Easy AND *Economical* TO USE

By adding only 8 ounces or less of DELTA 96•B SAND RELEASE AGENT, per ton, to your core or molding sand mixes, your sands will flow freely . . . be easier to handle . . . easier to use. They will not stick to core boxes or patterns no matter how intricate they may be.

DELTA 96•B SAND RELEASE AGENT is the result of persistent research by DELTA Laboratories devoted to the discovery and development of a lubricant-dispersant for use in sand mixes. DELTA 96•B is a liquid which provides properties hitherto unknown in sand conditioning materials. It is completely volatile at elevated temperatures and does not contaminate the sand.

READ WHAT USERS SAY ABOUT DELTA 96•B SAND RELEASE AGENT

". . . . with the addition of 8 ozs. of Delta 96•B we are now able to blow cores we otherwise couldn't blow."

". . . . Delta 96•B gives the sand improved flowability. Our sand now works much more freely and leaves the core boxes clean."

". . . . and the trouble we had with sand sticking in the hopper, in the chute and on the conveyor has been eliminated with the use of Delta 96•B."

•

Prove it yourself in your own foundry. Ask for a test sample. No cost or obligation. You will also receive instructions for use. Write today.

DELTA OIL PRODUCTS CO.

MILWAUKEE 9, WISCONSIN

Designed for *any* sand

The CP-25-PV SAND RAMMER is so responsive to the operator's handling that he can quickly adjust the ramming stroke to any compacting condition.

Consistent performance is assured by the rammer's "pulley valve" design, which also provides accurate control of speed and power. Any wear of "pulley valve" parts does not affect the rammer's performance.

Chicago Pneumatic offers both floor and bench model sand rammers in varied sizes to meet every foundry requirement. Write for full information.

THE CP "STEEL-CLAD" GRINDER

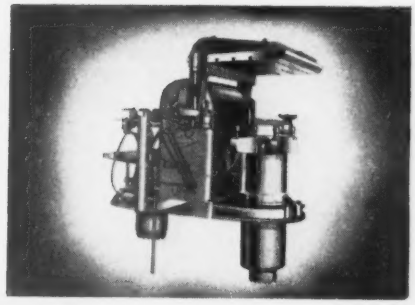
—built to take a tough beating and stay in constant service—maintains its speed regardless of the load. Described in Bulletin SP-2068.

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N. Y.

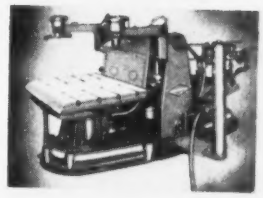
PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

DON'T
let your costs get you out on a limb

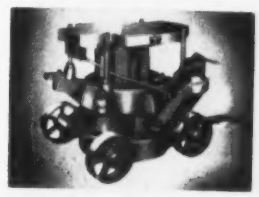


Jolt Rollover Draw
Model A

Plain Jolt
Model AJ-16



Jolt Rollover Draw
Model SA

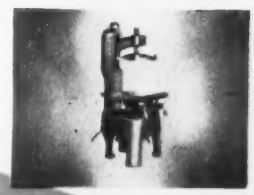


Jolt Pin Lift
Model AJS (Portable)

You can lower your costs . . . deliver in less time . . . and produce better castings when your foundry is equipped with "Davenport" molding machines.

Meet today's competition with today's mechanized machinery.

Let us send you our complete catalogue.



Jolt Squeeze
Model 10-JX (Stationary)

DAVENPORT MACHINE AND Foundry Company
DAVENPORT IOWA U.S.A.

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YOU

...and the **BRONZE** Situation

Tin is in short supply. This means that many of the bronze casting alloys containing substantial percentages of tin are frequently difficult to obtain.

In this situation Federated offers two suggestions that are promising and easy to follow.

When faced with the problem of alloy selection, consult with your supplier. Federated Metals, for example, has the extensive experience . . . in research laboratories and in the field . . . which qualifies its metallurgists to assist you in the selection of the best available alloy and to advise you on problems of foundry practice.

In addition, Federated offers a group of copper-silicon casting alloys with mechanical properties *exceeding those of industrially used tin bronzes.* The group is called HERCULOY* Bronzes.

Herculoy Bronzes combine high strength and excellent physical properties with a high resistance to corrosion. They can replace both ferrous alloys and tin bronzes. Foundrymen like Herculoy Bronzes because of their excellent foundry characteristics. Castings are sharp in detail. The metal pours freely and can be cast into sand or permanent molds. No special equipment or techniques are required for melting and handling Herculoy. No smoke or noxious fumes are produced in melting.

More information on Herculoy Bronzes is contained in a 4-page pamphlet that is yours for the asking. Write for it today . . . or for help with any non-ferrous metal problem.

**Registered trademark of Revere Copper and Brass, Inc.*

Federated Metals Division

Federated first in the non-ferrous field FMD

AMERICAN SMELTING AND REFINING COMPANY • 120 BROADWAY, NEW YORK 5, N.Y.

"B&W ALLMUL FIREBRICK *gives me twice the performance for my money!"*

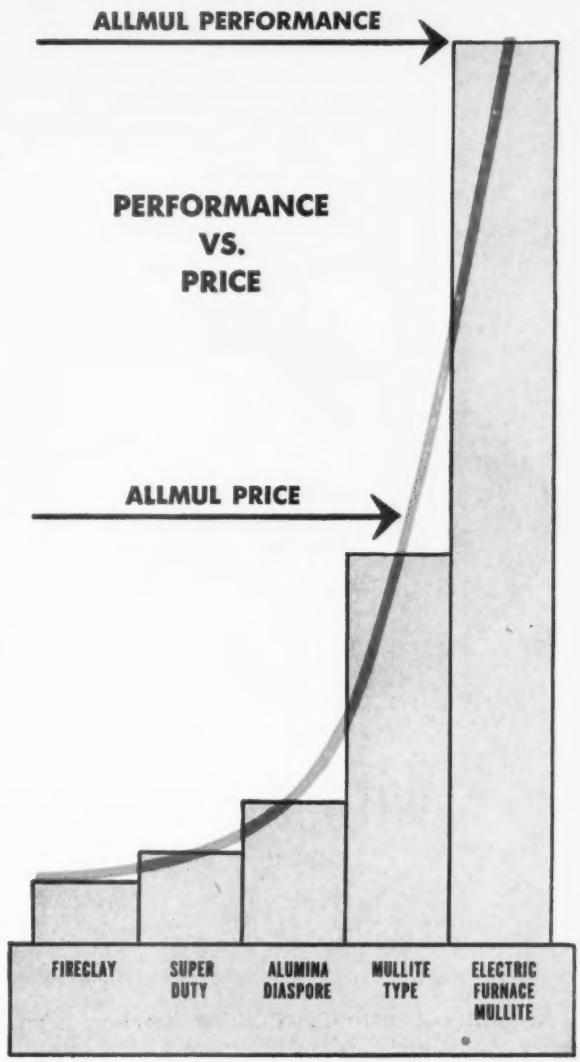
You, too, may discover new and truly important ways to save money with B&W ALLMUL — the new performance-proved, electric-fused mullite fire-brick. B&W engineers have designed special mass production methods to produce this incomparable firebrick at a cost hitherto considered impossible. One result is the performance vs. price ratio charted at the right. And it's a big result, economically.

Another is a long list of Allmul repeat orders for the most severe service applications — ferrous and non-ferrous melting furnaces, slag melting furnaces, glass tanks, checker chambers, ceramic kilns and many others.

The properties described in the panel below explain why Allmul eliminates need for frequent furnace relining, cuts maintenance and saves valuable production time.

If you have not already investigated this remarkable new firebrick, we urge you to do so at once. The sooner you start using B&W Allmul, the greater your ultimate savings will be. SEND FOR NEW BULLETIN R-29.

ALLMUL is another important refractories development by B&W engineers who have continuously established new standards in industrial furnace refractories for the past 30 years.



CHECK THE PROPERTIES OF ALLMUL!

Here's how B&W Allmul stood up under standard tests.

SPALLING—12 cycles of heating to 2550F and chilling in cold air and water spray. **Result—no loss.**

HOT LOAD DEFORMATION—1½ hours at 3050F under load of 3600 pounds per square foot. **Result—less than 2% deformation.**

PERMANENT VOLUME CHANGE UNDER REHEATING—After 5 hours at 3200F. **Result—less than ½% change.**

FACT—no other firebrick in Allmul's price range can match its performance. **Fact**—no mullite brick at **any** price can better the performance of B&W Allmul.

BABCOCK & WILCOX

THE BABCOCK & WILCOX CO.
REFRACTORIES DIVISION
GENERAL OFFICES: 85 LIBERTY ST., NEW YORK 6, N.Y.
WORKS: AUGUSTA, GA.

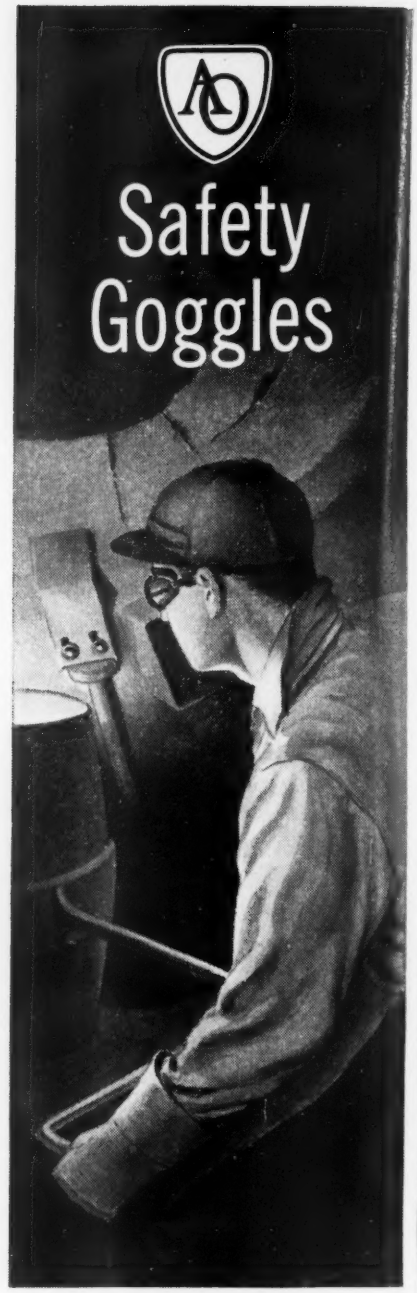
R 394

B&W REFRACTORIES PRODUCTS — B&W 80 Firebrick • B&W Junior Firebrick • B&W 80 Glass Tank Blocks • B&W Insulating Firebrick B&W Refractory Castables, Plastics and Mortars • OTHER B&W PRODUCTS—Stationary & Marine Boilers and Component Equipment... Chemical Recovery Units . . . Seamless & Welded Tubes . . . Pulverizers . . . Fuel Burning Equipment . . . Pressure Vessels . . . Alloy Castings

EXTRA

VENTILATION

with this AO Foundry Goggle



An AIR CONDITIONED GOGGLE has long been "must" equipment with foundrymen who need greater ventilation capacity to help keep lenses from fogging. The AO 351A Foundry Goggle provides *maximum* air cooling comfort in hot and humid surroundings while preventing flying particles from injuring the eyes. THE EXTENSION RINGS OF THE "351" PROVIDE ALMOST DOUBLE THE USUAL VENTILATION AREA without loss of strength or impact resistance. Your nearest AO Safety Products Representative can supply you.

QUICK FACTS

- Individual eyecups shaped to contour of each eye, with smooth, rounded edges, won't conduct heat or electricity. Low set for wide angle vision. Many side perforations increase ventilation.
- Ball-chain bridge is insulated with tubing, curved for snug, comfortable fit and quickly adjustable.
- 50 mm. Super Armorplate or 6 Curve Super Armorplate clear or Calobar lenses in medium, dark or extra dark shades.
- Available with rubber cushions around edge of eyecups at slight extra cost.

American Optical
COMPANY
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

"Information Headquarters" for Foundrymen

looking for ways to make

Better Cores

Good core makers know that the perfect binder to fit *every* job hasn't been invented. And never will.

Experience tells them it takes the *right sand and oil combination* to make cores that produce sound, accurate castings. To reduce rejects, they know they must use core binders with controlled *uniformity,* too. And with high tensile strength regardless of baking temperatures.

Through extensive tests in our laboratory and in the field, we *know* these are facts. Hy-Ten Core Oils are the result of this research, and we are always ready to advise you which one will give you the properties you need to make higher quality castings consistently.

We believe the Houghton Man can help your core makers keep costs down as well. Why not turn your core problems over to him for proof right in your foundry? A confidential letter outlining your special problems will be answered promptly and completely. Write to the Product Development Department, E. F. Houghton & Co., Philadelphia 33, Pa.

HY-TEN CORE OILS . . . products of

E. F. HOUGHTON & CO.
PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO

Ready to give you on-the-job service . . .

Want to CUT COSTS on these *Important* Portable Grinding Jobs?

For Heavy Metal Removal

For Grinding Hard-to-get-at Places

For Light Metal Removal

NO matter what combination of cutting action and length of wheel life you require for maximum economy on your portable grinding jobs, Norton Company, with its research facilities, engineering skill and wide product variety, can fill your requirements.

For Heavy Metal Removal — you'll like fast-cutting Norton grinding wheels of ALUNDUM or CRYSTOLON abrasive and resinoid or vitrified bond.

For Grinding Hard-to-get-at Places — you'll find a variety of Norton wheels available in just the right sizes and shapes to make this job easy.

For Light Metal Removal — you can't beat the latest Norton abrasive development, safe, easy-to-use *Reinforced* Hub Wheels.

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NORTON ABRASIVES

Making better products to make other products better

Molding Machines

New Bulletin describes SPO line of Jolt Pin Lifters

Complete data on the Series 3000 high-production jolt pin lifters are presented in this new illustrated catalog which is available to foundry management and purchasing personnel such as superintendents, foremen, production expediters, etc. Designed for maximum speed, safety and ease of operation, these machines feature the patented SPO "inverted jolt" mechanism.

The jolt pin lifters described in this publication have jolt capacities ranging from 750 to 4000 pounds and are fully adjustable to meet diversified production demands. Pivot type adjustable lifting pins will accommodate any type or size of flask within their capacities. Both breakaway and secondary draw speeds can be adjusted to different job requirements, and jolt impact intensity of each machine is variable.

In this catalog, dimensions, capacities, pattern draw, SPO vibrator size and other pertinent data are tabulated for quick reference. Photographs and line drawings depict the construction and features of the various machines.

Bulletin No. 30 will be sent upon receipt of coupon or letterhead request.

129-SI

SPO INCORPORATED

6449 GRAND DIVISION AVE., • CLEVELAND 5, OHIO

SPO, Incorporated

Please send (without obligation) your new illustrated Bulletin No. 30.

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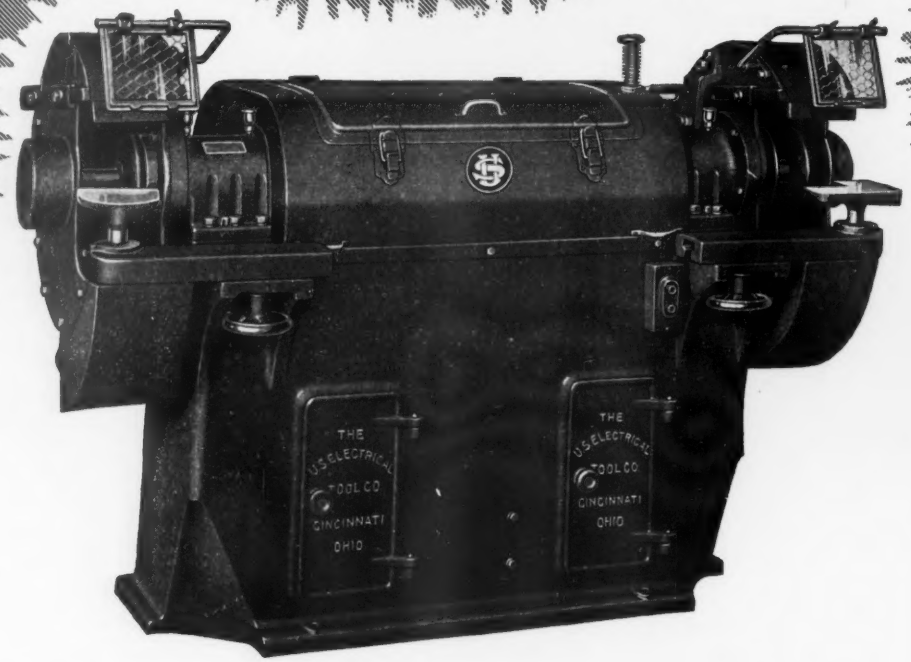
America's Greatest QUALITY GRINDER VALUE



FREE FROM VIBRATION

FOR UNIFORMLY QUALITY GRINDING

U.S. ADJUSTABLE SPEED SNAGGING GRINDER

Model 66 . . .

THREE SPEED CHANGES

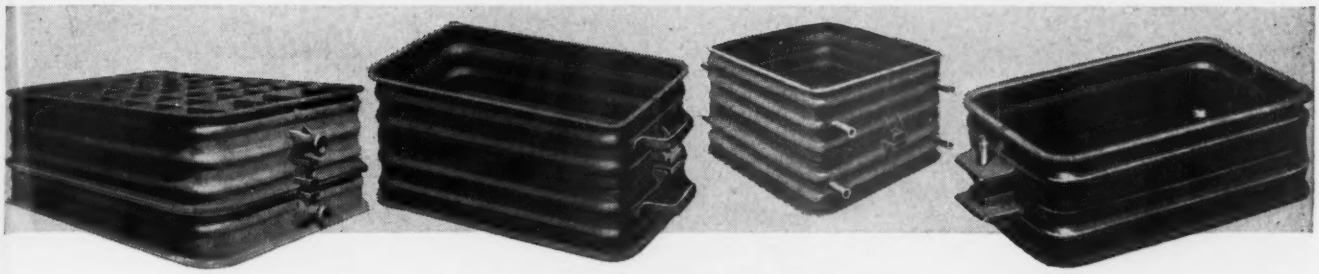
Feed this great grinder job after job . . . put it to the most gruelling task . . . make the most exacting demands . . . and MODEL 66 will come through with flying colors always.

Chrome-manganese steel shaft supported by four heavy-duty ball bearings enclosed in dustproof housing protected by labyrinth seals. Push button control and overload protection.

VIBRATION-FREE belt drive. Speed changes to compensate for wheel wear are made by elevating motor on its hinged tray. Patented safety device prevents over-speeding. WHEEL GUARDS ADJUSTABLE TO WHEEL WEAR.

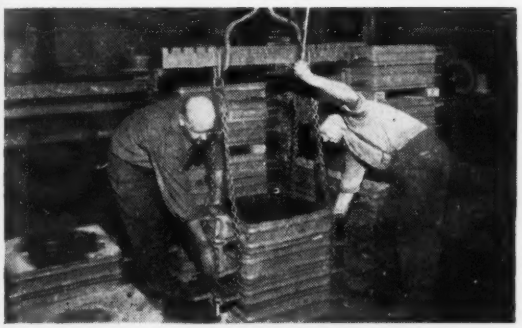
Get in touch with your jobber. United States electrical tools are carried in stock.

The UNITED STATES ELECTRICAL TOOL Co.
CINCINNATI, OHIO



WIDE RANGE OF HANDLES AND PIN LUGS

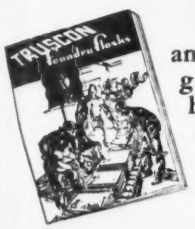
Assure Efficient Truscon Steel Flask Performance



The needs of your particular operations can be met efficiently by Truscon welded end handles, welded corner handles and welded handle sockets for two-man handling. Straight trunnions and heavy split trunnions are available for mechanical handling. Truscon Pin Lugs are available as follows: Single or double-bearing welded combination handle and pin lug for use on one-man flasks. Single or double-welded type pin lugs, and double face welded type dowel pin lugs, for use on one or two man flasks.

CORRECT WALL THICKNESS

Assures Efficient Truscon Steel Flask Performance



No need for battleship *thickness* in flask walls. Correctly engineered thickness, highly durable materials, and scientific design, as exemplified in Truscon Steel Flasks, give battleship *service* without unnecessary weight or shop handling costs. ● Truscon Steel Flasks have a long record of success in foundry operations, particularly under extreme conditions of heavy service. An experienced Truscon man will be glad to explain the many advantages which Truscon Steel Flasks offer you.

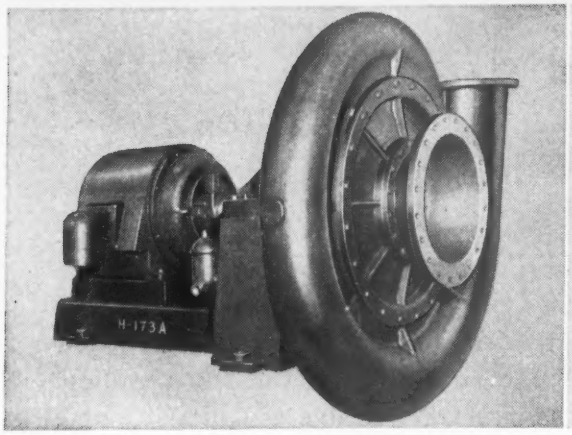
Write for illustrated and descriptive catalog.

TRUSCON STEEL COMPANY

PRESSED STEEL DIVISION • 6100 TRUSCON AVENUE • CLEVELAND 4, OHIO

SUBSIDIARY OF REPUBLIC STEEL CORPORATION

Take no chances on V-P-L



CENTRIFUGAL

Type OIB Centrifugal Blower for cupola service. Capacity 15,220 cfm.

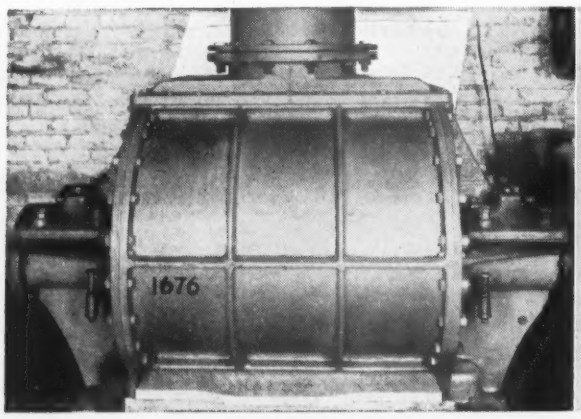
V for Volume—P for Pressure—L for Low power cost.

Those are three essentials for adequate blower performance to keep your cupolas going at top capacity to meet today's urgent production demands. You're sure of all three, with Roots-Connersville Blowers.

That's the case whether your plant calls for Centrifugal or for Rotary Positive units. You can have either type, from the exclusive R-C *dual-ability line.* Capacities range from 5 cfm to 100,000 cfm, thus permitting the selection of a size closely matched to your specific demands. Frequently, this freedom of choice saves time, cost, space, weight and power.

R-C engineers will gladly help you select the right blower with the V-P-L needed to keep production moving.

ROOTS-CONNERSVILLE BLOWER CORPORATION
510 Madison Avenue, Connersville, Indiana



ROTARY

Type RCS Blower in midwestern foundry, for cupola service. Capacity 4,400 cfm.

ROOTS-CONNERSVILLE

BLOWER BUILDERS SINCE 1854

ONE OF THE DRESSER INDUSTRIES

Readers' COMMENT

An Orchid for the Artist

TO THE EDITORS:

In connection with the series of articles dealing with the nickel-brass alloys which have been appearing under my signature, I feel that your make-up man has an eye for beauty in laying out the charts and photographs. The layouts offer a lesson to us in acquiring appearance in the job without sacrificing practicability.

JAMES S. VANICK
Development & Research Division
International Nickel Co. Inc.
67 Wall St., New York 5

* * *

Shell Molding Process

TO THE EDITORS:

We are interested in getting a tear sheet on article in August, 1950 FOUNDRY issue devoted to "Plastic Bonded Shell Molds Used in New Casting Process."

Your magazine is read from cover to cover, including every advertisement and you deserve compliments on its excellent presentation.

J. J. DELANY
President
Coyne & Delany Co.
Kent and Park Aves.
Brooklyn 5, N. Y.

* * *

Suggests Electric Melting

TO THE EDITORS:

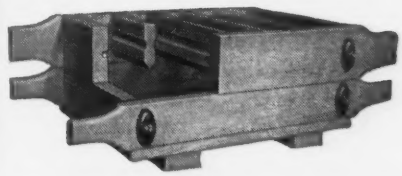
In the January issue of FOUNDRY, in the "Questions and Answers" department, we noticed under the heading "Using Steel Scrap in Mixture", "Change in Coke Causes Trouble" and "Melting Borings in the Cupola", that the inquirers are having extreme difficulty in obtaining the proper gray iron composition, and we believe that much of the trouble can be overcome by use of low-frequency induction type electric furnaces for superheating and melting gray iron.

In this type of furnace steel scrap and turnings can be added in any quantity with perfect control of C and Si contents at all times. Iron can be carbonized, decarbonized and desulphurized in the same furnace, and the alloy can be held for any length of time in the same state without burning out any components. Furnace

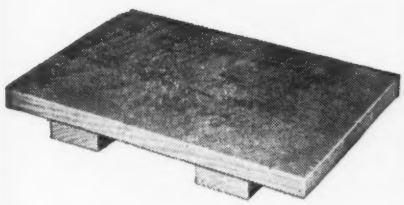
(*Concluded on page page* 80)

FOUNDRY SPECIALTIES

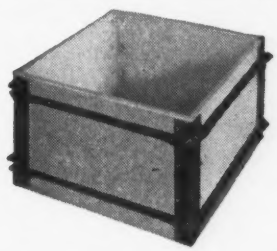
WEDGES
Hard or soft wood



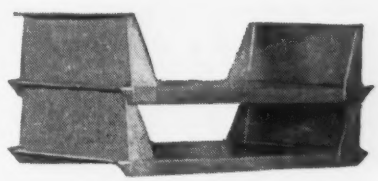
CMD WOOD FLOOR FLASKS
All sizes and shapes



CMD WOOD BOTTOM BOARDS
All sizes and shapes



CMD NON-WARP, NON-BURN SLIP JACKETS



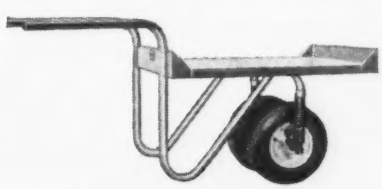
CMD DUAL-PURPOSE CORE TRAYS

CMD TYPE F CHIPPING HAMMER
Metal handle. Head has 2 chisels at right angles

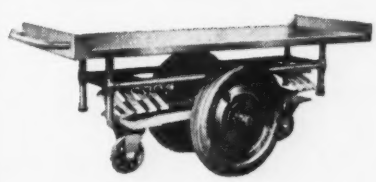
CMD TYPE A CHIPPING HAMMER
Combination drift and chisel

CMD TYPE C CHIPPING HAMMER
For general hand chipping

TEXTITE AIR SEPARATOR
Cools, cleans and dries the air in one operation. *No moving parts.* Saves air tools. Nothing to replace.



CMD PNEUMATIC CORE BARROWS
With single wheel or two wheels. (as shown here)



CMD PNEUMATIC CORE TRUCKS
Minimize core chafing and breakage

WRITE FOR BULLETINS
On CMD core-conveying equipment and other foundry specialties—preferred by experienced foundrymen for 25 years.

CHICAGO MANUFACTURING & DISTRIBUTING COMPANY

1928 WEST 46th STREET CHICAGO 9, ILLINOIS

AN IMPORTANT SERVICE

We can now furnish, to pattern shops and foundries, pattern and core box castings without the necessity of lightening core boxes or backing off master patterns or core boxes. If you will send us your master pattern or core box or core stick, we shall be glad to quote you and supply complete information.

Photographs by courtesy of Erie Malleable Iron Company

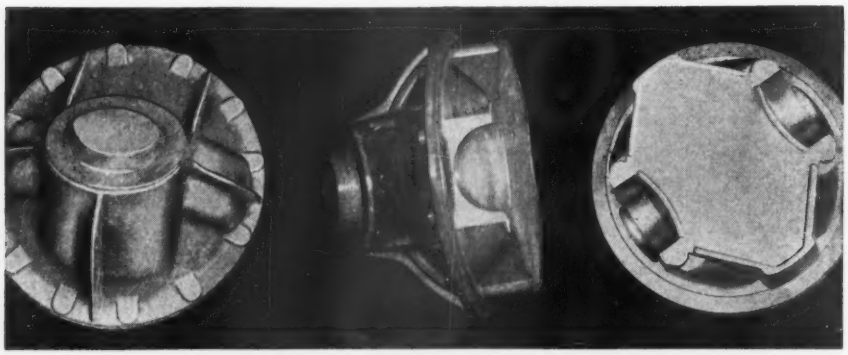
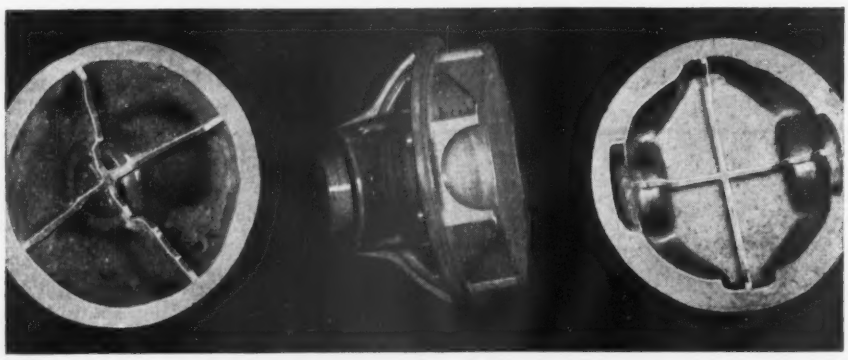


Photo shows face of pattern castings made from master pattern shown in center.



Pattern castings, showing method of lightening out.

Core box casting made from solid wood master core box, showing backing frame and method of backing off

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(*Concluded from page 78*)

can be used for temperatures up to 2800° F. Current consumption for melting is around 500 kwhr per ton for superheating of 400° F, approximately 100 kwhr per ton.

We manufacture a low-frequency induction furnace of German design. We are the American manufacturers of the Russ designed low-frequency furnace that is being successfully used in Europe for this purpose.

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* * *

We Lose an Old Reader

TO THE EDITORS:

Please discontinue my subscription for FOUNDRY as I have sold out my business two years ago and am not connected in any way with the foundry. As my foundry days started back in the year of 1907, and the saying is the foundry is a good place to work, to me it was a wonderful place to work. I have at all times enjoyed reading FOUNDRY. And now I wish to thank you for many hours of good reading.

WALTER J. MARTZ

622 *Columbia St.*
South Bend, Ind.

* * *

The Editorial Index

TO THE EDITORS:

Will you please send an editorial index for 1950.

The writer also wishes to congratulate the publishing staff of FOUNDRY on the excellent job that is being done in the presentation of foundry news and information in the new and attractive FOUNDRY magazines of the past few months.

SEM S. BRUBAKER JR.
Foundry Superintendent

Steel Heddle Mfg. Co.
Southern Shuttles Division
Greenville, S. C.

* * *

Word from Down Under

TO THE EDITORS:

We would like to take this opportunity of congratulating you on FOUNDRY, and the exceedingly interesting information it contains each month. In our opinion it is the best foundry magazine we receive, and we receive several from various countries. It is exceptionally well printed and is a credit to your entire staff.

H. S. TANNER

Tanner Engineering Ltd.
Penrose, New Zealand

DON'T BUY A PIG IN A POKE . . .

or sell one either

X-RAY

With the world's finest radiographic apparatus now available, why take chances on buying or selling imperfect castings. It's like a pig in a poke when you do, for only x-ray equipment can detect many hidden defects in castings.

Scores of companies now rely on General Electric X-Ray industrial units, such as the OX-250 shown here, for proof of sound castings. Job lot or production line, x-ray fits. Spot checking or 100% inspection, it can be adapted to your particular need. A pound of metal or a ton, there's a GE X-Ray unit to meet the need — dependably, economically, profitably.

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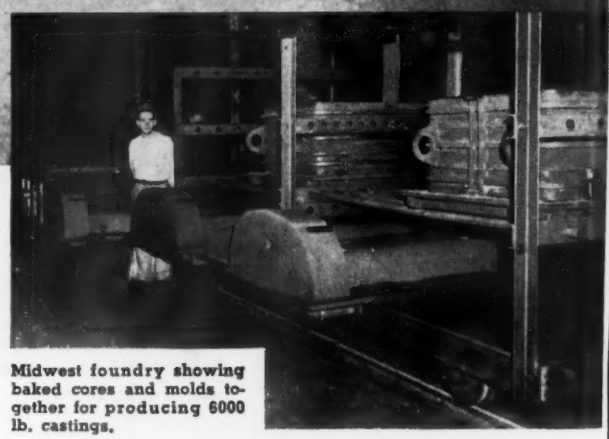
PIT Molding with STERLING Flasks



Midwest foundry showing baked cores and molds together for producing 6000 lb. castings.

After Trying Them All.. *Only STERLINGS Could Do the Job!*

This well-known Midwest foundry was faced with the difficult problem of producing big food machinery castings, each weighing about 6000 lbs. . . . a real HE man job for any foundry. After experimenting with various types of flasks with resultant heavy loss of castings, the company turned to Sterling Heavy Duty Rolled Steel Flasks. Now their casting scrap is down to a minimum. In spite of the fact that five Sterling Flask sections are stacked 108" high, precision castings are obtained. Only Sterling Steel Flasks could do such an accurate job.

STERLING WHEELBARROW COMPANY, Milwaukee 14, Wis., U. S. A.

A 5903-1P-C

CMP May Help

NATIONAL Production Authority has announced that a Controlled Materials Plan will be placed in operation July 1 to govern allocation of steel, copper and aluminum. In contrast to the World War II CMP which distributed these metals for all purposes, the present "open-end" version will be limited to allotments for only direct defense and defense-supporting production and construction requirements. Once these essential needs have been satisfied, remaining supplies become available for nondefense uses.

While it would appear that this system means a continuation of the scramble for what materials are not earmarked for direct and indirect defense purposes, NPA hopes to strike a rough balance between supply and demand for the left-over tonnages by using such restrictions as "M" and limitation orders to reduce less essential civilian production and provide proportionate distribution of metals to both large and small users.

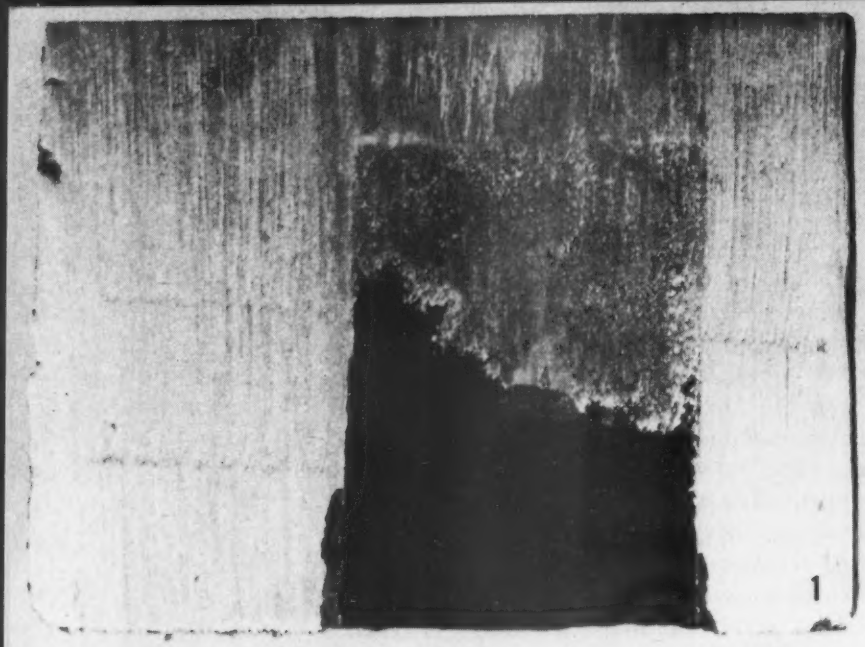
NPA emphasizes that it is vitally concerned with maintaining a strong economy—full employment and high dollar volume of total business. CMP will assist in this by making it apparent when demands of the defense and defense-supporting agencies exceed the selected maximum set-aside percentages of steel, copper and aluminum supplies, and dictate the scaling down of these demands.

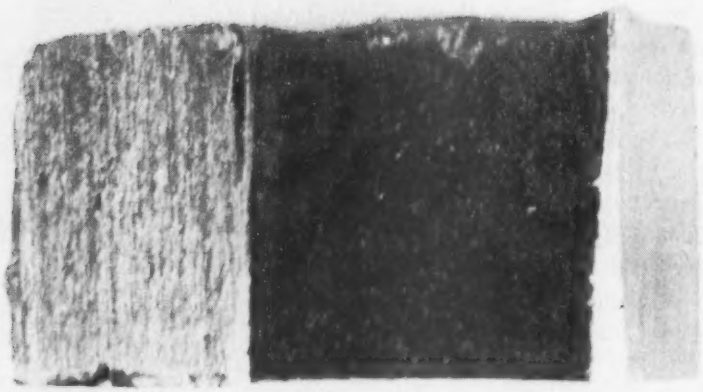
Complete details concerning the plan will be supplied industry in time to make it operative as scheduled. In the near future manufacturers of military items, products for the Atomic Energy Commission and certain defense-related projects will file their requirements under CMP regulations. In addition, all other manufacturers of products using steel, copper and aluminum—excepting, at least for the present, consumer durable goods—will be required to file. With this information, NPA will be able, for the first time, to determine actual defense needs and the impact of these needs on civilian production. An intelligent determination of how much should be used for defense under the "limited emergency" then should be possible.

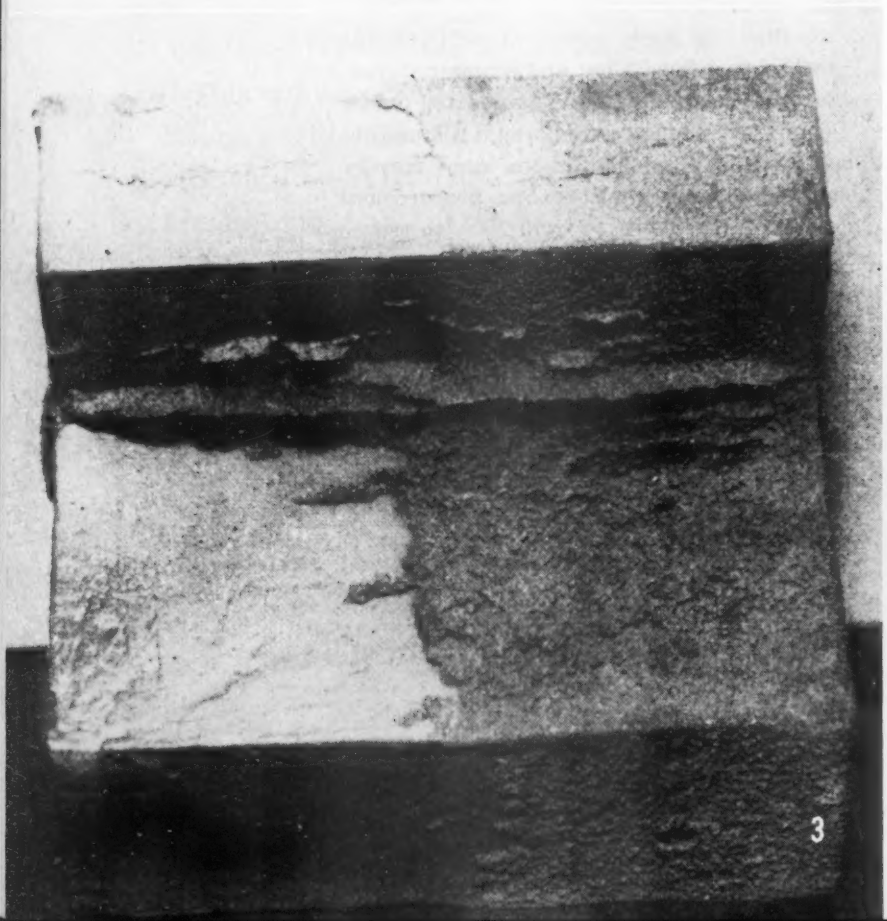
Reports from Washington indicate that the early effect of CMP on the foundry industry will be moderate. Steel, copper-base alloy and aluminum castings—but not gray iron or malleable iron castings—will be allocated under CMP. Allocation of pig iron and ferrous and nonferrous scrap to foundries is not now contemplated as a regular procedure, but nonferrous ingot may be so distributed. While foundries will be expected to handle their own procurement of raw materials, they will receive assistance, if necessary, from NPA to secure sufficient supplies for products programmed under CMP. Manufacturers of foundry equipment are included among those companies which shortly will file their steel, copper and aluminum requirements.

The CMP worked successfully during the last war in providing a fair distribution of materials, and it should correct the present situation in which DO ratings have become ineffective under the expanding load of defense work. What will result from the "open-end" policy of allocating material for only essential purposes remains to be seen.

Frank G. Steinebach
Editor







METAL

For years foundrymen have been seeking to prevent the surface roughness produced when molten metal is forced for a considerable distance into the interstices between the sand grains. While offering no cure-all for the problem, the author suggests several procedures directed toward correcting the condition. This paper was presented before the 14th annual Wisconsin Regional Foundry Conference in Milwaukee, Feb. 8

Fig. 1 — Metal penetration. Approximately half of the core has been penetrated

Fig. 2 — Burn-on. Penetrated layer less than 1/16-in. thick

Fig. 3—Example of veining. This shows fins protruding on the surface of casting. (After Morey and Kattus[1])

Fig. 4—Standard casting as used for penetration work

By S. L. GERTSMAN
Physical Metallurgist
Mines Branch, Department of Mines and Technical Surveys
Ottawa, Canada

PENETRATION

THE phenomenon known as metal penetration has troubled foundrymen for years, and it has been recognized that a major research effort is necessary if this complex problem is to be eliminated.

When metals of low melting point are cast, not much difficulty usually is encountered with penetration; that is, if fine sand is used and good ramming is employed. Steel, bronze and other copper alloys are probably the greatest offenders in regard to metal penetration; cast iron also gives trouble at times but to a much lesser extent. The major part of this paper deals with the work carried out on steel. Some references are made to bronze and cast iron, mainly to show that some of the factors involved are fundamental to the penetration of all metals.

Fig. 1 illustrates what is meant by metal penetration—often referred to as "burn-on." This is a section cut through a core which is penetrated.

Metal penetration is the name applied to surface roughness produced when molten metal is forced into the interstices between the sand grains for a considerable distance. An interlocking mass of sand and metal is produced whose thickness is over 1/16-in. If the surface roughness or adherence is less than 1/16-in., the term "burn-on" is used. This terminology is an arbitrary standard set up for convenience. Fig. 2 shows an example of burn-on—the adhering layer is less than 1/16-in.

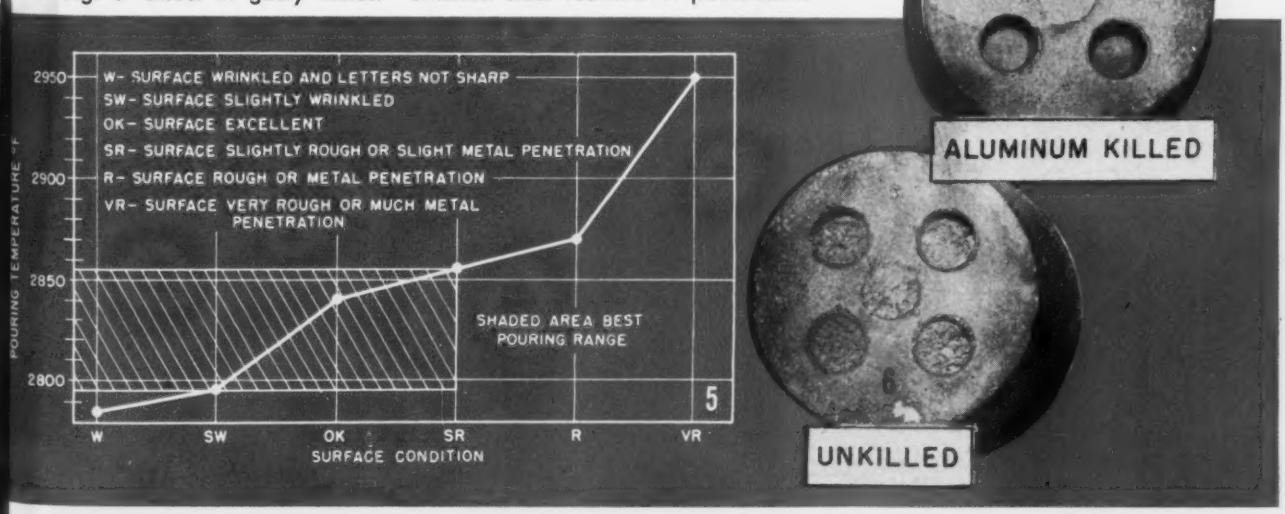
Fig. 3 is a phosphor bronze casting taken from a paper by Morey and Kattus[1]. This shows "veining" —the fins protrude over the surface of the casting. At the right of the casting is another example of metal penetration. This casting shows veining to be associated with metal penetration (right) and veining without penetration (left) so that the veining mechanism should be considered separately from metal penetration.

Some idea of the complexity of the problem of metal penetration can be obtained by the number of factors which have to be considered in an investigation on metal penetration. Several are indicated below. These are given at random and in no specific order of importance.

1. Surface tension of the molten metal.
2. Wetting characteristics of the metal on the sand.
3. Temperature of the metal.
4. Size of the voids between the sand grains.
5. Pressure across the mold-metal interface.
6. Chemical reactions which may occur at the mold-metal interface, and the formation of slag barriers.
7. Expansion characteristics of the surface sand

Fig. 5—Effect of pouring temperature on a small casting (Lillieqvist[2])

Fig. 6—Effect of gassy metal. Unkilled steel resulted in penetration



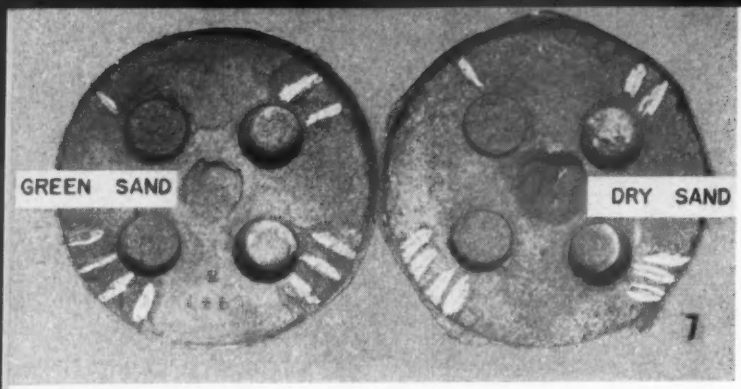


Fig. 7—Effect of silica flour additions on green and dry sand cores. No. 1, 10% silica flour; No. 2, 25%; No. 3, 50%; No. 4, 10% plus 1% iron oxide. Included 5% bentonite. Metal 2850°F; 36-in. head

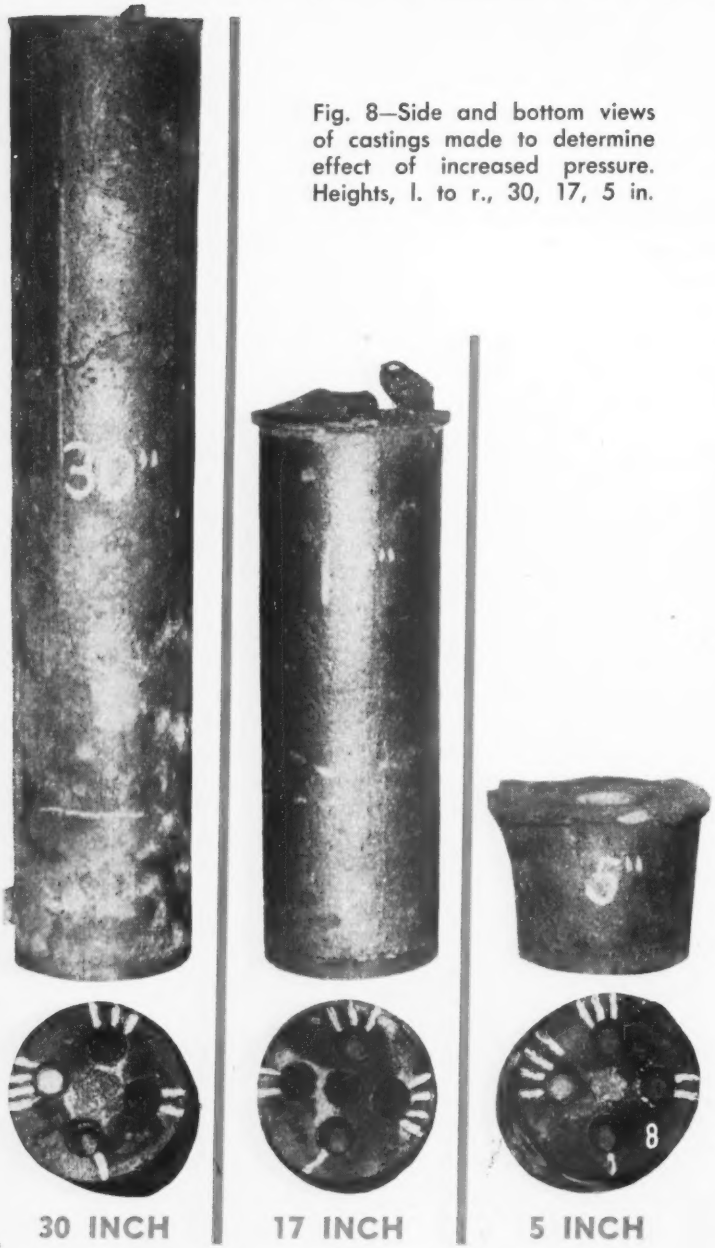


Fig. 8—Side and bottom views of castings made to determine effect of increased pressure. Heights, l. to r., 30, 17, 5 in.

grains, i.e., the tendency of the heated grains of sand at the surface to expand and shear from the adjacent layer.

There are numerous other factors which have not been mentioned.

The most desirable method for evaluating the effects of different variables connected with the surface finish of castings is to use a casting of standard shape and dimensions.

Fig. 4 shows the casting developed at the Mines Branch for penetration work. This casting weighs 45 lb, is 5½ in. in diameter across the bottom and 5 in. high. Four cores, each 1⅛ in. in diameter by 2 in. in height, project 1¾ in. into the bottom of the casting.

In using this casting it was extremely difficult to get metal penetration (over 1/16-in.). To produce metal penetration readily with the 5-in. casting, gassy steel had to be used. Fig. 6 shows this effect. The same four cores were used in each casting. Unkilled steel, which is gassy, resulted in penetration for all the cores, whereas with aluminum-killed steel (which is not gassy), none penetrated.

The ease with which gassy steel causes metal penetration has been duplicated with gassy bronze. Other investigators[2] have found that when they cast bronze which was gassy, it was very difficult to prevent metal penetration. So here we have a metal condition—namely, high gas content—which can cause metal penetration. Foundrymen producing steel, bronze and other copper alloys should not neglect the possibility of gassy metal if difficulty is being encountered with metal penetration, especially in small castings.

With the casting shown in Fig. 4, it was found that burn-on could be obtained by using very hot metal. It was not possible, however, to produce penetration much in excess of 1/16-in. by using fully killed steel even at pouring temperatures of 3170°F.

Fig. 9—Effect of ferrostatic pressure when gray iron poured at 2475°F. Oil sand core compositions: No. 1, all No. 50 sand; No. 2, all No. 175 sand; No. 3, 75 parts No. 50 and 25 parts No. 175; No. 4, 25 parts No. 50 and 75 parts No. 175; No. 5, 50 parts No. 50 and 50 parts No. 175

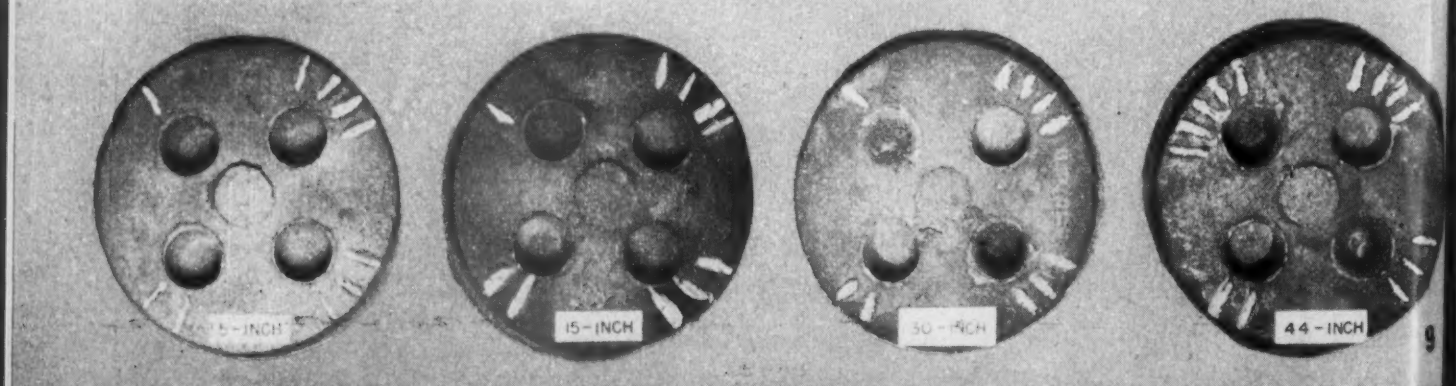


TABLE I—Effect of Pouring Temperature (30-in. Casting, Series B)

Core No.	2800° F	2950° F	3030° F
1B	Penetrated ⅞ way	Penetrated ⅞ way	Penetrated ⅞ way
2B	Bad burn-on	Bad burn-on	Penetrated ⅛ inch
3B	Slight burn-on, veining	Slight burn-on, veining	Bad burn-on
4B	No penetration	No penetration	Burn-on

Fig. 5 shows the results which Lillieqvist[3] obtained qualitatively on a small 12-lb casting when he varied the pouring temperature. A difference of 30°F in pouring temperature from 2840 to 2870°F was enough to change a smooth surface to a rough surface (probably burn-on according to our definition).

Although pouring temperature is most important in studying burn-on or thin layers of sand adherence on small castings, it could not be considered as the only cause. It is difficult to produce thicker layers of metal penetration merely by increasing the pouring temperature. Other factors must be involved since severe penetration is encountered in the foundry.

Pressure was considered as one possible factor since, in actual practice, larger castings are most susceptible to metal penetration, and larger castings having higher heads can have greater pressures at the metal-mold interface.

Furthermore, gassy metal produced severe penetration on a relatively small casting. This could possibly be due to high internal pressure created by the gas coming out of solution as the metal kept dropping in temperature.

To determine the effect of increased pressure on metal penetration, three castings were poured, 5, 17 and 30 in. in height. Fig. 8 shows views of these three castings. The same four cores were used in each casting. For example, No. 1 core is exactly the same in each casting, No. 2 mix is different from No. 1 mix, but No. 2 in the 5-in. is the same as No. 2 in the 17 and 30-in. castings, and so on. They were all poured from the same heat at 2950°F.

It will be observed that for No. 1 core the 5-in. and 17-in. castings were satisfactory. The 30-in. casting shows heavy veining.

Core No. 2: The 5-in. casting shows no penetration; the 17-in. casting is completely penetrated, and the 30-in. casting is completely penetrated.

Core No. 3: No penetration is shown with the 5-in.; none with the 17-in.; the 30-in. casting is completely penetrated.

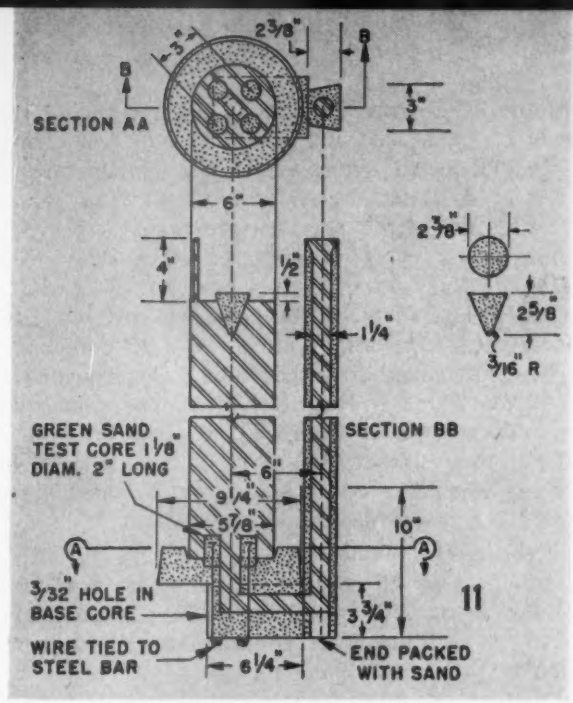


Fig. 11—Diagram illustrating method employed to anchor green sand cores in pouring test castings

Core No. 4 is serpentine rather than silica sand. Serpentine was being tested as a foundry sand and it was tried for cores in these penetration experiments.

This test has been duplicated with iron, and the results are shown in Fig. 9. It can be seen that increasing the pressure caused an increase in penetration when coarse sand was used (No. 1 and No. 3 cores). Increasing the height of the casting or the metallostatic pressure caused the metal to penetrate when all other conditions were kept reasonably constant. A test method is therefore available for metal penetration.

By using short heads the effects which will be produced on small castings (burn-on) can be obtained. Higher heads simulate conditions produced by larger castings. Furthermore, by increasing the height of the casting the severity of the test is increased. The height at which a certain set of conditions produces metal penetration is the determining factor whether those conditions are good or bad insofar as metal penetration is concerned.

Fig. 11 illustrates how the casting is used for green sand or dry sand cores. To prevent the cores from floating, a wire folded into two, with a loop formed at the top, is rammed into the core. Holes are made in the bottom core to allow the wires to pass through. They are then tied to steel rods. This is unnecessary

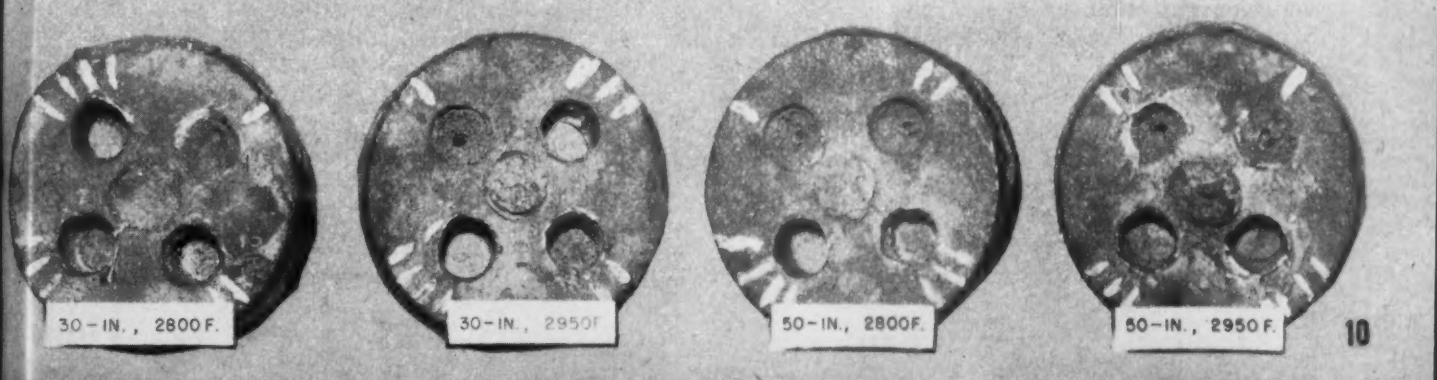


Fig. 10—Effect of silica flour additions on oil sand cores. Silica additions are listed in text

for the oil sand cores, as paste is used to anchor the cores.

Table I shows the effect of pouring temperature on a series of oil sand cores having No. 57 New Jersey sand as a base with 1 per cent cereal and 1 per cent linseed oil. Varying amounts of silica flour were used. Core No. 1B was 100 per cent No. 57 sand and no silica flour. With a 30-in. head this core was badly penetrated at all temperatures. No. 2B core had a 25 per cent silica flour addition. Penetration increased at 3080°F. No. 3B had 50 per cent silica flour. There was a slight increase in burn-on at 3080°F. No. 4B core had 100 per cent silica flour. No penetration was obtained at 2800°F and 2950°F. At 3080°F some burn-on was produced.

Increasing the temperature from 2950°F to 3080°F had an effect on all cores, but that effect was somewhat decreased with increasing silica flour additions. The effects of silica flour additions are more clearly demonstrated in Figs. 7 and 10.

Fig. 10 shows the same four cores (the silica flour series) poured into 30-in. and 50-in. castings at 2800°F and 2950°F. It will be observed that the No. 1 core, having no silica flour, penetrated badly in all cases. The No. 2 core—the 30-in. casting at 2800°F and at 2950°F—produced bad burn-on. However, by increasing the height to 50 in., the 25 per cent silica flour core penetrated half way at 2800°F and three-quarter way at 2950°F. The No. 3 core—50 per cent silica flour—showed some veining and burn-on at 2800°F and 2950°F at 30 in. The 50-in. casting, when poured at 2800°F, showed $\frac{1}{8}$-in. penetration on the inside wall and at 2950°F $\frac{3}{8}$-in. on the inside wall. The No. 4 core, which was 100 per cent silica flour, showed no penetration at 50 in. at either 2800°F or 2950°F pouring temperatures.

A beneficial effect is produced by using silica flour additions in steel oil sand cores. As the silica flour was increased to 100 per cent no penetration was produced even for a height of 50 in.

Fig. 7 illustrates the effect of silica flour additions on green sand and dry sand cores. For green sand a 25 and 50 per cent silica flour addition produces very good results—Nos. 2 and 3. For dry sand the 50 per cent silica flour gives excellent results whereas the 25 per cent addition is not quite as good.

Tests on oil sand cores showed no significant difference in penetration effects when a wide or narrow screen distribution sand of the same average screen size was used. For a subangular sand, however, it was found that the average fineness should be less than 0.075 mm to prevent penetration in castings with a high metal head.

Fig. 15 shows the effect of metal head or pressure and temperature on green sand mixes. New Jersey No. 57 sand was used with 5 per cent western bentonite and $3\frac{1}{2}$ per cent moisture. The last vertical row shows that, as the casting height is increased, the lower is the pouring temperature at which complete metal penetration is obtained. The 5-in. casting shows burn-on only at 3100°F, the 24-in. casting is completely penetrated at 3050°F, whereas the 30-in. is completely penetrated at 2950°F.

For the same pouring temperature, 2800°F, (note

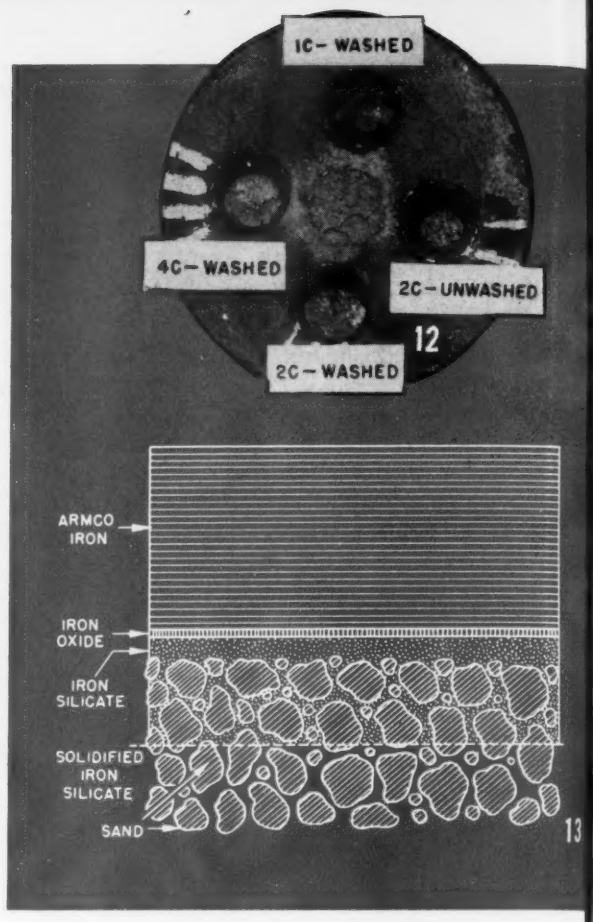


Fig. 12—Showing effect of wood flour additions

Fig. 13—Schematic diagram illustrating the formation of a slag barrier. (After Hoar and Atterton[4])

the first vertical row), increasing the height of the casting increased the metal penetration. The 5-in. casting is not penetrated; the 24-in. has about 1/16-in. penetration, and the 30-in. casting has $\frac{1}{2}$-in. of penetrated metal.

Within the temperature range of 2800-3100°F, and the pressure range obtained between height of 5-30 in., it would appear that pressure is the more potent factor causing metal penetration. The 5-in. casting has to be poured at 3100°F to produce burn-on, whereas at 2800°F increasing the height of the casting from 5 to 30 in. is enough to cause approximately $\frac{1}{2}$-in. penetration.

Fig. 12 shows the effect of 2 per cent wood flour additions to oil sand cores both in the washed, with silica flour wash, and the unwashed condition. With a 30-in. casting all cores penetrated completely. Fig. 12 is a 15-in. casting. Here wood flour produced a definite improvement in the washed condition by preventing veining and penetration. Cores 2C and 4C used in this casting produced a good surface. The unwashed wood flour core was penetrated about 3/16-in. The No. 1C core was New Jersey No. 57 sand and it veined badly when washed. With medium metal heads, washed wood flour cores are beneficial in preventing both veining and penetration.

Fig. 14 shows the results of a series of tests on green sand, oil sand, dry sand and dry sand with a silica sol binder. Some of the cores were washed

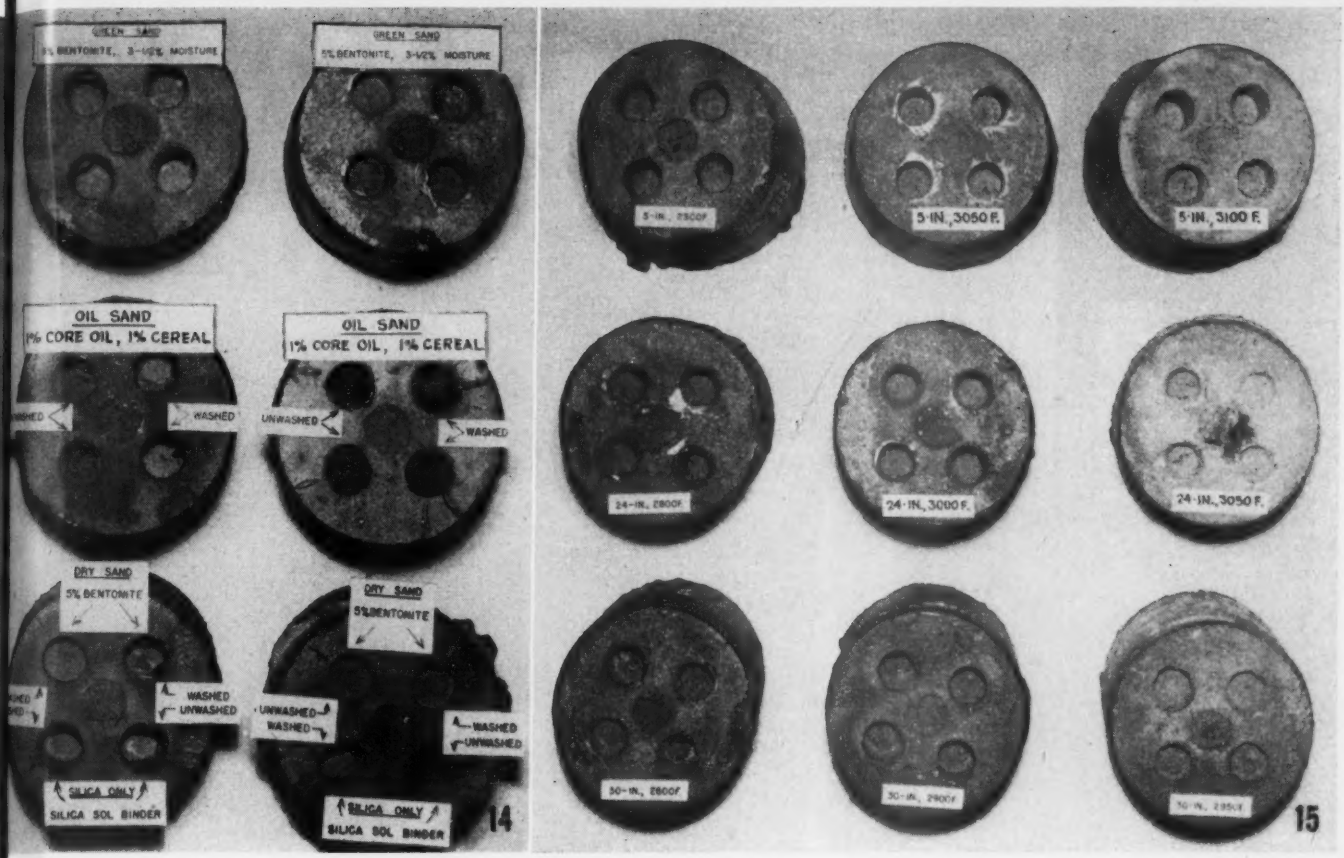


Fig. 14—Showing effect of core composition on metal penetration. Height of castings in left column is 24 in.; in right column 30 in.

Fig. 15—Effect of metal head and temperature on green sand cores

with a silica flour wash. This picture clearly illustrates the test method reported here. It will be observed that on the 24-in. castings there is some penetration along the side walls with the green sand cores. The 30-in. casting, with the same cores and at the same pouring temperature, produced worse penetration.

The washed oil sand cores merely show veining with the 24-in. casting but penetrate completely at 30 in.

The washed dry sand, the unwashed and washed silica sol binder cores were all satisfactory at 24 in., but at 30 in. a distinction is shown between these cores. Here, only the washed silica sol core was satisfactory. Thus, by increasing the casting weight, the severity of the test is increased and the effect of any variable may be evaluated.

Fig. 14 again shows that for medium casting heights a properly applied wash will help counteract penetration.

A great deal of attention is being given at present to washes as a possible solution to the metal penetration problem. Fig. 13[4] shows the prevention of penetration by the formation of a slag barrier (iron silicate in this case). A fused layer has formed at the surface. On penetrating the cooler layers of the sand, it has solidified to cause complete blockage. Here, no metal penetration can occur.

Should a wash crack, however, the metal will flow through this opening and cause a vein.

It should be pointed out that the work on washes has just started and that development in this direction may be expected in the future.

From the work carried out to date, the following path is indicated. None of these suggestions are "sure-cures", since the problem has not yet been overcome:

1. Use low pouring temperatures consistent with fluidity requirements for running the casting.

2. Ram well—but over ramming does not help.

3. Use fine-grained sands or make silica flour additions.

4. Use washes which will not crack under heat shock and use a thick enough wash layer to be effective. Caution should be exercised to carefully apply and dry the washes so that no cracks are formed in the wash prior to metal contact.

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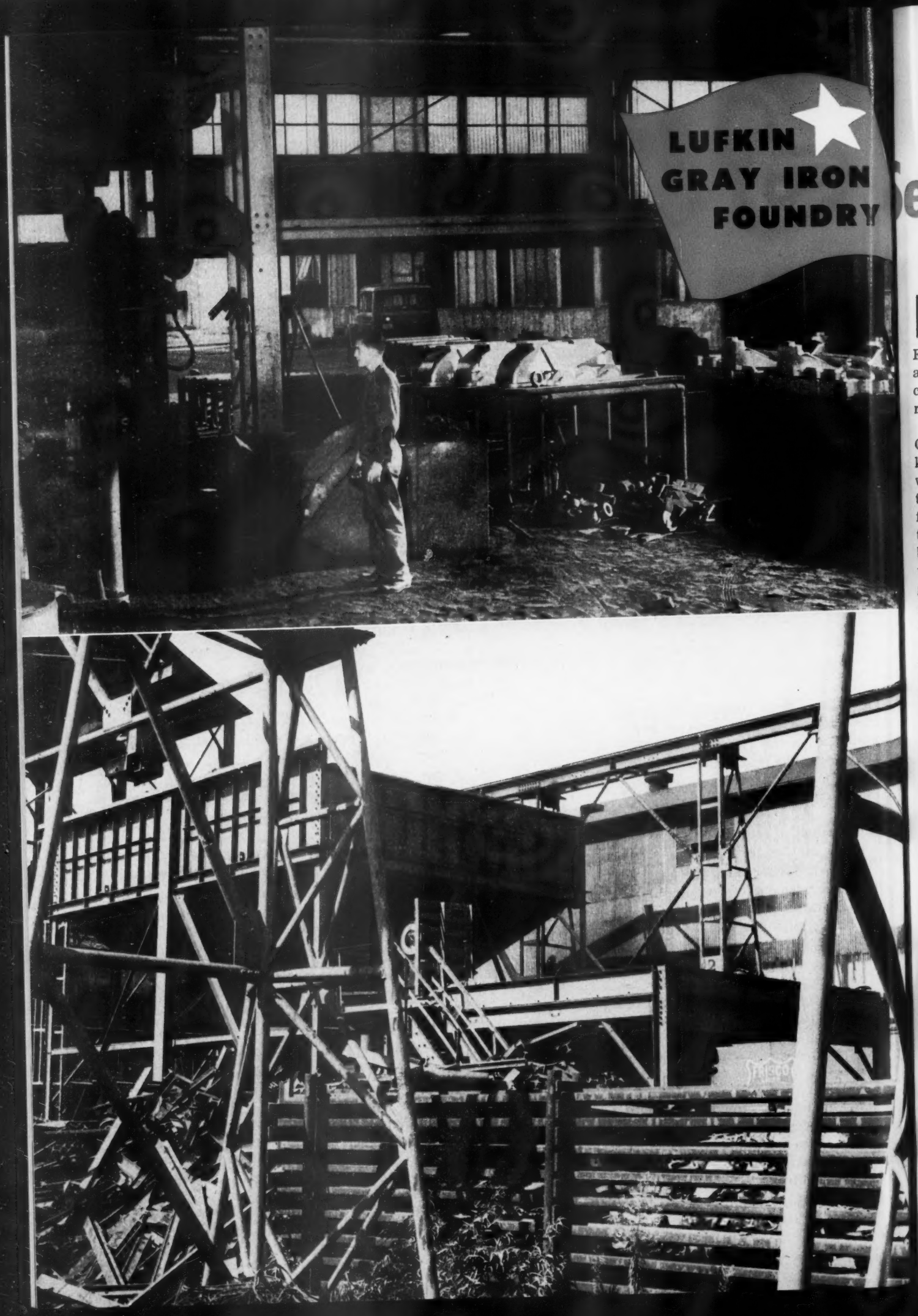
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Managing Editor
FOUNDRY

Serves Industrial Southwest

IT HAS been said that a man is known by the company he keeps. It might also be said that a foundry is known by the industries it serves. Fundamental operating practices naturally vary relatively little between individual foundries, but the castings produced and the plant facilities employed reflect to a large extent the customers' needs.

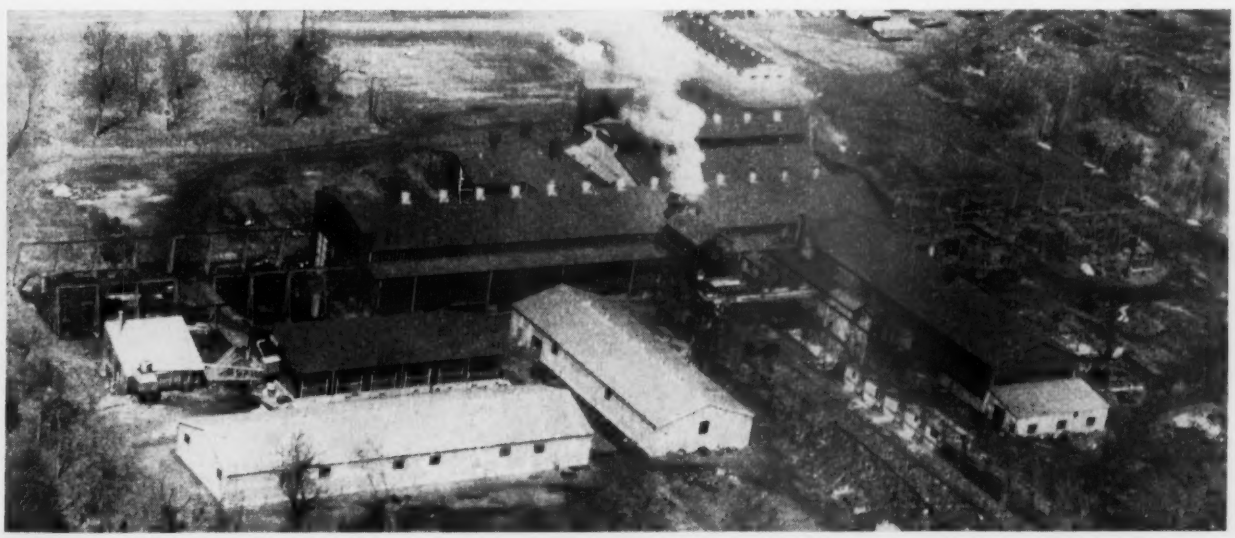
Take the case of the Lufkin Foundry & Machine Co., located in eastern Texas' industrial city of Lufkin. This company, employing more than a thousand workers, distributes a large share of its products to the petroleum industry. Probably it is best known for the more than thirty-thousand walking beam type pumping units of its manufacture which are bobbing up and down in oil fields throughout the world. In addition, it specializes in building gas engines for pumping and other services, geared speed reducers and increasers, tractor winches and commercial truck trailers.

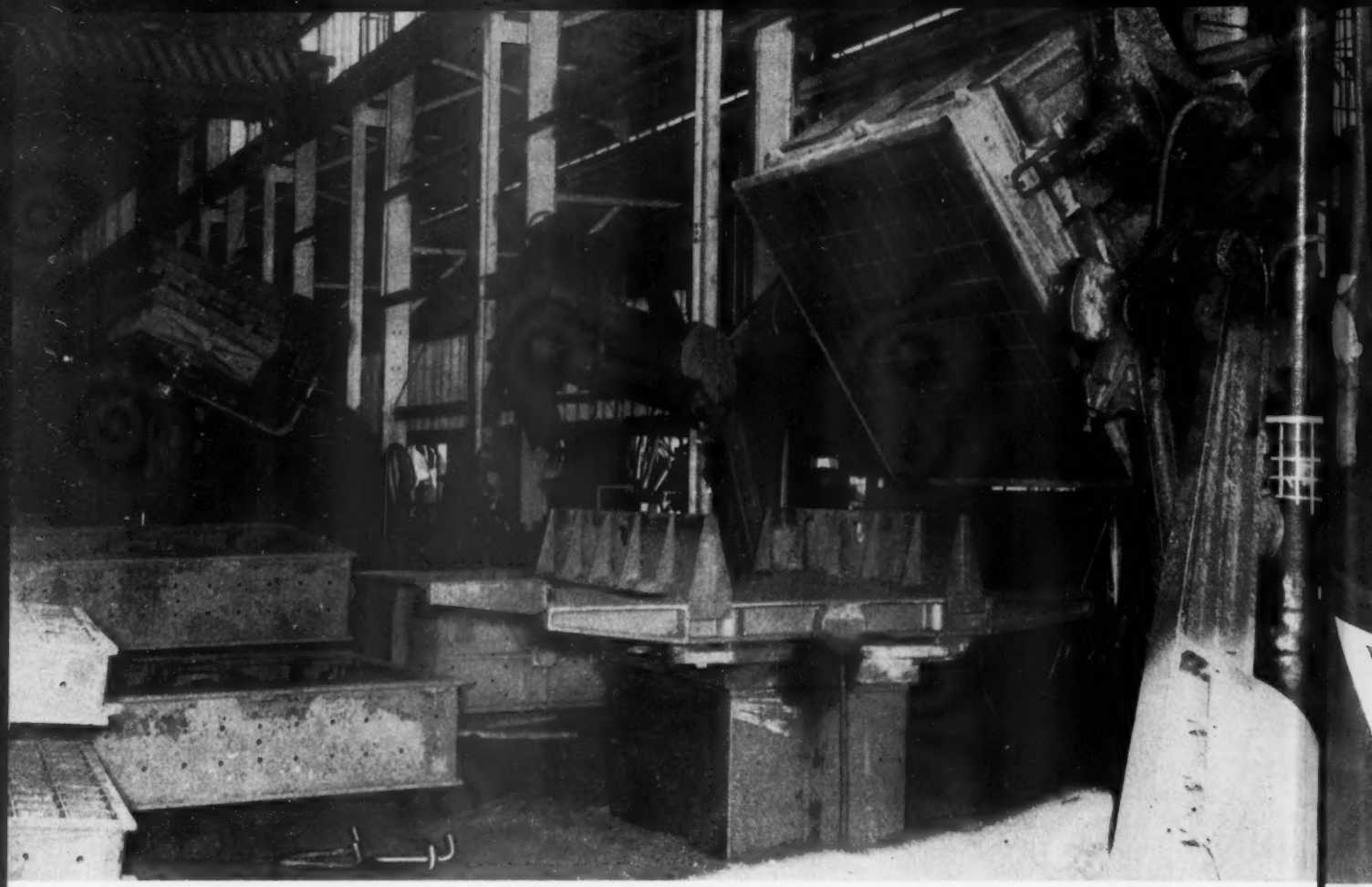
Large, as well as small, gray iron castings are required for certain parts used in fabricating most of these products, including counterweights for the walking beams of pumping units, flywheels for engines, and large gears for speed reducers. Consequently, the Lufkin foundry has been designed to turn out on an efficient basis these castings which vary in weight from less than 1 lb to 7000 lb. Because of its extensive requirements of gray iron castings, the company has operated its own foundry for many years and consumes about 90 per cent of the total output. The balance, sold in the jobbing market, goes to a variety of users and includes both large and small castings for equipment used in the petroleum, chemical, paper mill and other industires of the Southwest that require castings up to 15 tons.

The need for increased quantities of castings and better quality product prompted the company, shortly after the war, to build a new foundry. The old foundry was taken over by other manufacturing facilities, and a modern plant was erected on a nearby plot to provide a daily melting capacity of 175 tons.

The present foundry (Fig. 3) consists essentially of a large main bay with separate wings or individual buildings devoted to coremaking, casting cleaning, patternmaking and pattern storage, sand preparation and production of small castings. Measuring 60 x 300 ft, the main bay is a high-ceiling, well illuminated structure. Fourteen 10-hp exhaust fans on the roof keep dust and smoke in the foundry at a minimum. In warm weather ventilation is aided further by opening massive doors at both ends of the building. A flask storage yard extends from one end of the main bay, and a yard for storage of castings

Fig. 1 (top left)—Large patterns are moved from storage by lift truck to roller conveyor leading to molding machines. Fig. 2 (bottom left)—Pig iron is stocked in bins made from lengths of old steel rails. Craneway supports were fabricated from steel shell case material. Fig. 3 (below)—Aerial view of the foundry, Lufkin Foundry & Machine Co., Lufkin, Tex.





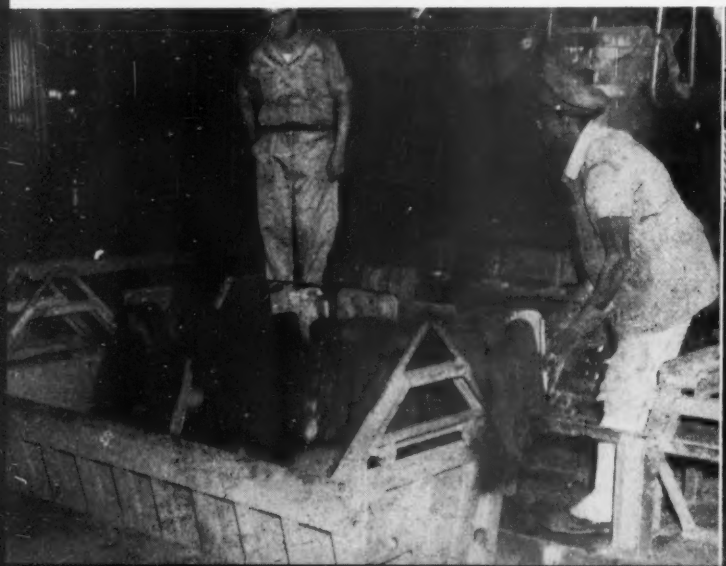
is located at the opposite end. Both yards are under an extension of the main bay craneway. The raw materials storage yard extends at right angle from the main bay at its midsection where the melting department is situated.

Built during a period when supplies of structural steel were difficult to obtain, considerable ingenuity was displayed in constructing facilities for storing and handling raw materials. Structural members of the 72 x 400-ft craneway consist of tubular steel shell case material which was asembled by welding and bolting. Several of the craneway supports are shown in Fig. 2. Bins for storing pig iron actually were made from scrap. Sides of the bins are closely spaced lengths of old steel rails. These are held in position between uprights consisting of pairs of pipe, as shown in Fig. 2. To date in these days of scrap scarcity the company has avoided experiencing the corresponding plight of the family that was forced to burn its furniture to keep warm.

A magnet-equipped, 5-ton capacity crane serving the raw materials yard carries scrap and pig iron to a weigh hopper located a short distance from the cupolas, as seen in Fig. 9. A gasoline-engine pow-

Fig. 6—Poured molds are dumped from roller conveyors into this box for transfer to the shakeout

Fig. 7—Hinged door at end of transfer box permits molds to be deposited on 4 x 6 ft shakeout screen



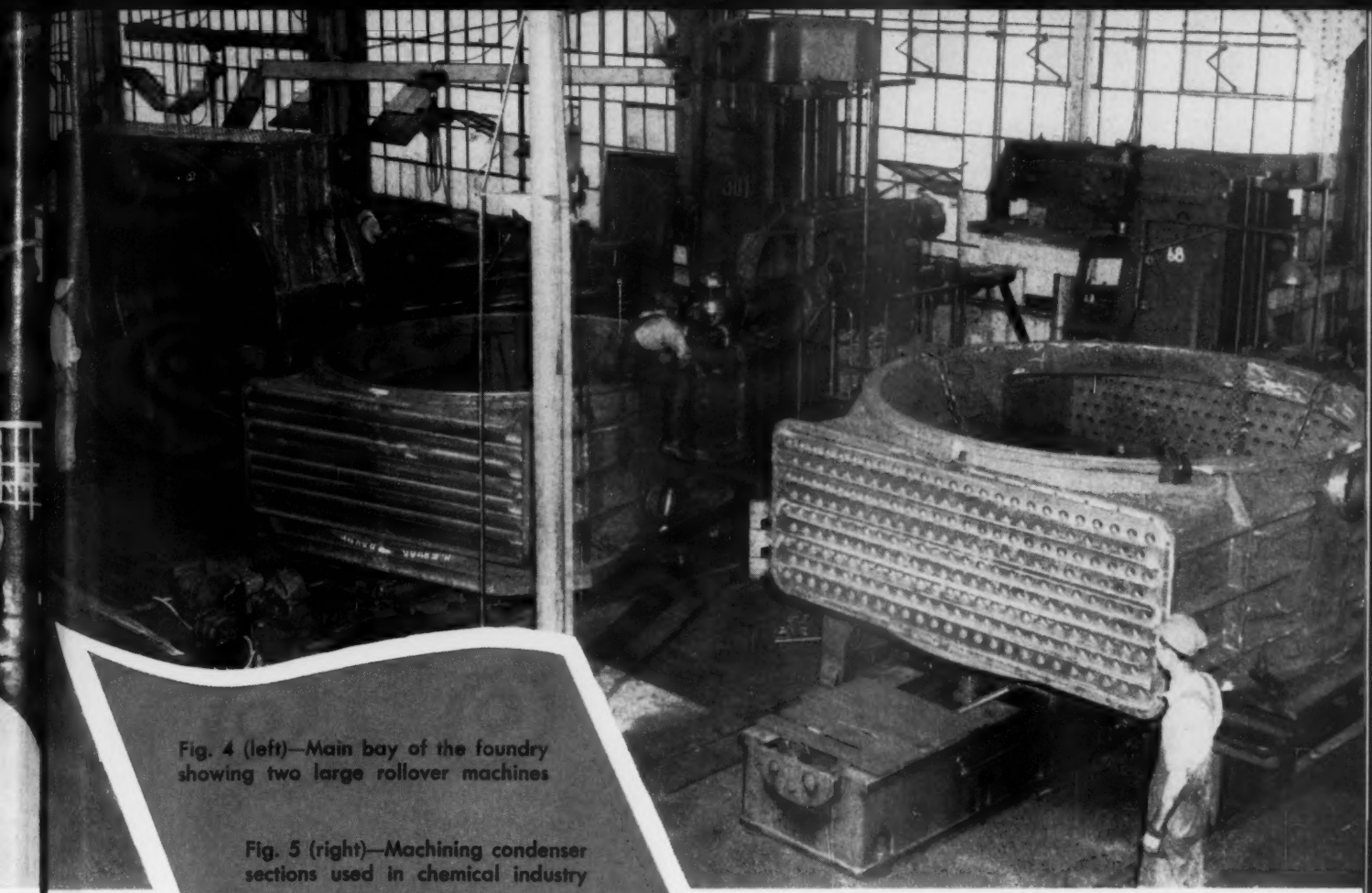


Fig. 4 (left)—Main bay of the foundry showing two large rollover machines

Fig. 5 (right)—Machining condenser sections used in chemical industry

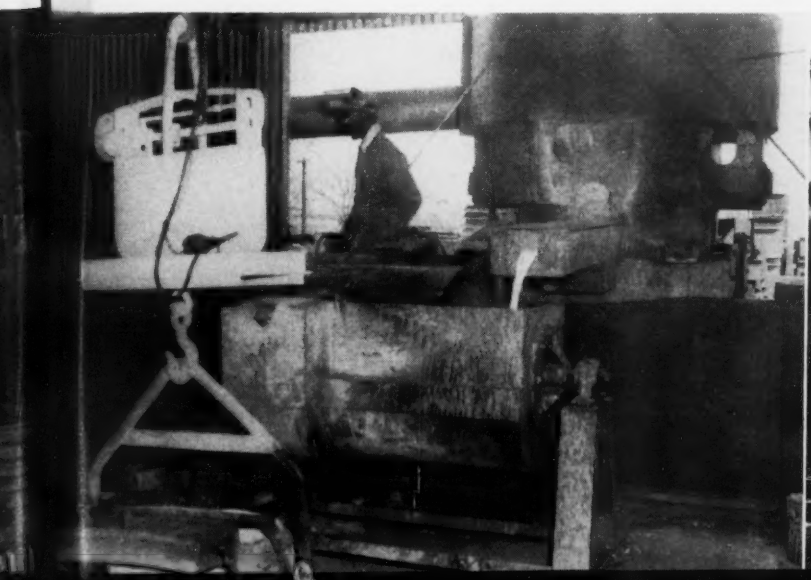
ered transfer car operates over a track directly below the metal and coke hoppers to move metal and fuel charges to the furnaces. Accurate weights of material are discharged into a cone-bottom bucket and transferred to a monorail charging hoist which elevates the bucket to the cupola charging door and discharges it.

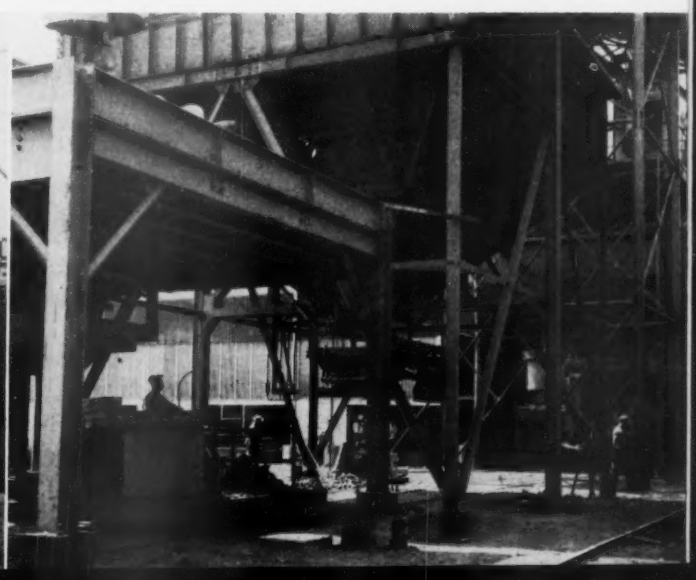
Melting facilities consist of three cupolas, one lined to 72 in. inside diameter, one 60 in. diameter, and one 36 in. diameter for nodular and other side bay castings. Metal is tapped at about 2800° F into a large mixing ladle before transfer into pouring ladles. Nearly 85 per cent of the iron poured is for the larger castings made in the main bay. Smaller castings, down to less than a pound, are molded and poured in a 80 x 120 ft side bay from the 36 in. cupola (Fig. 8).

Making large molds by machine usually presents a problem when it is necessary for a foundry to change patterns frequently. Considerable time is lost and much effort is expend- (*Please turn to page* 165)

Fig. 8—One of three cupolas operated. This 36-in. furnace is used for nodular iron and small castings

Fig. 9—Pig iron and scrap are moved by transfer car from a weigh hopper to cupolas for charging





By K. S. SEALANDER
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Melting Practices for MAGNESIUM ALLOYS

Recommended procedures in the melting department of the magnesium foundry are discussed in this paper presented at the sixth annual meeting of the Magnesium Association in New York, Nov. 9, 1950

WITH the objective of producing magnesium castings of high quality, the Aluminum Co. of America's magnesium foundries the last few years have investigated practices for making magnesium alloys. This work has resulted in improvement in both melting operations and quality of castings.

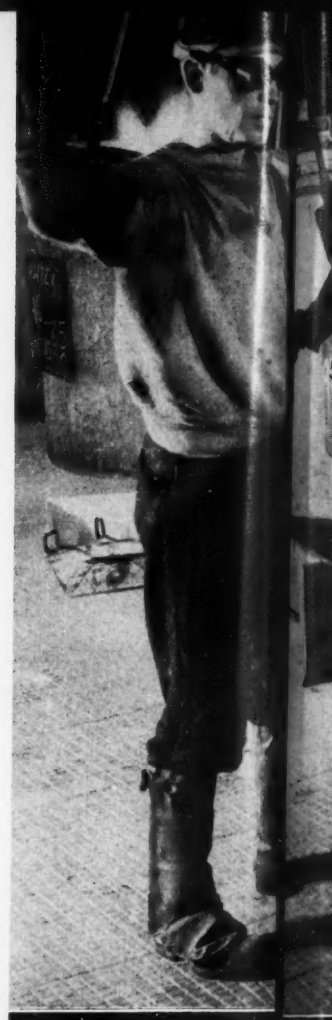
Some of the problems in establishing an efficient melting operation are: Control of the alloying constituents and impurities; elimination of dross and flux; removal of dissolved gas, and control of grain size. By a scheduled procedure for melting, it is possible to reduce the metal loss, avoid off-analysis composition, reduce haphazard and excessive use of flux, reduce surface burning, and produce substantially gas-free metal.

Proper metal preparation prior to melting is very important, perhaps equally as important as the melting operation itself.

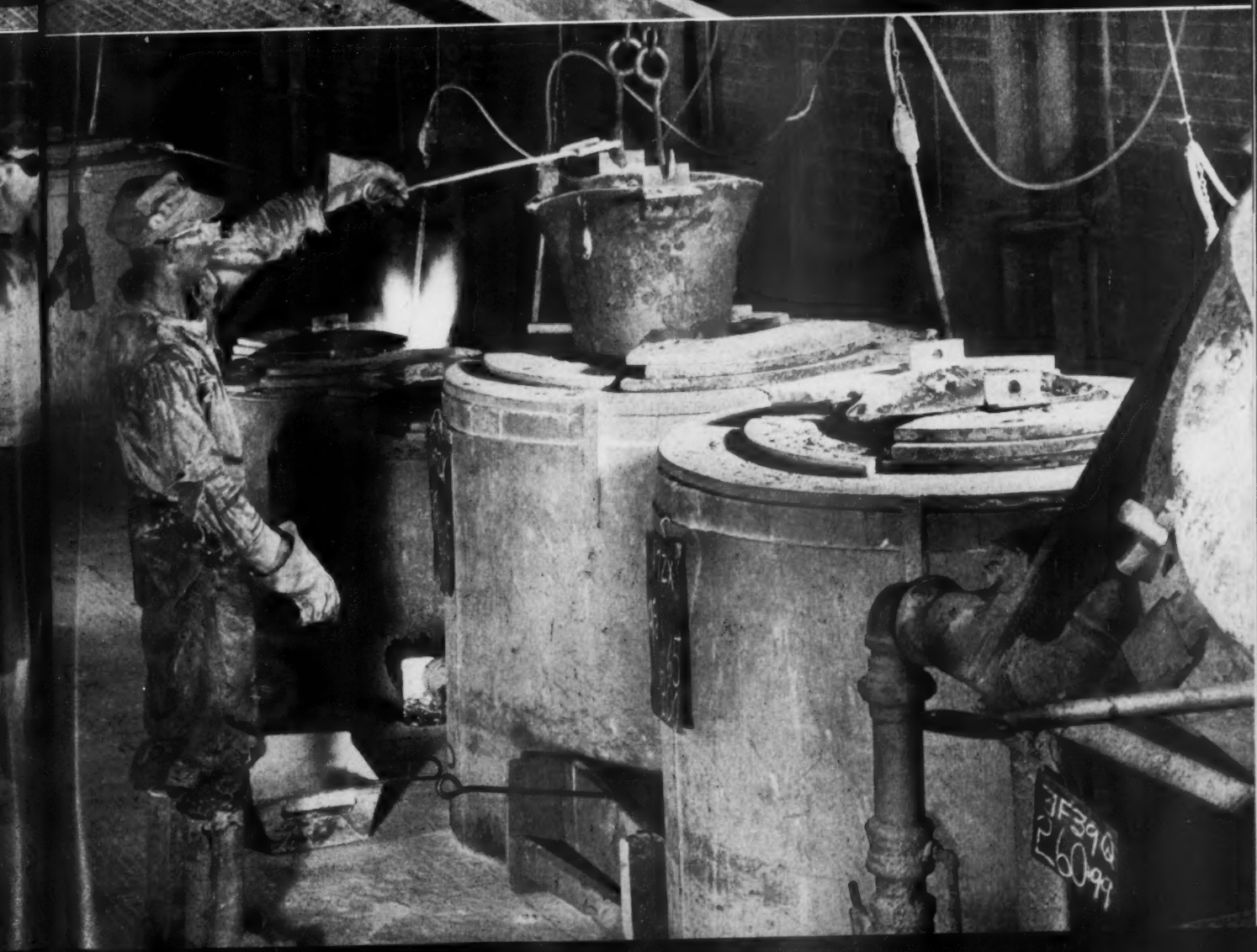
An accurate record of composition of the metal on hand should be maintained and made available to furnace room personnel. Different alloys should be kept in separate trucks or bins. This procedure makes it possible to use the metal according to some plan. It is usually desirable to balance a charge by including foundry operating scrap, primary ingot and reclaimed metal which will not result in excessive gas or off-composition melts. These charges can be handled normally and can be used immediately in the foundry.

Composition records also make it easier to keep the composition of a melt within desired limits. If calculation or analysis shows that melt is outside these limits, the necessary additions can be more easily made to bring it back into range. This eliminates costly delays for adjustments after an analysis has been made.

Another important step in the preparation for melting is eliminating contamination of the metal. One contaminant is silicon, which may be attributed to molding or core sands adhering to defective castings, gates and risers. To minimize contamination from this source, castings are sand blasted. Sand blasting of castings, including gates and risers, is desirable after they come from the foundry and knockout and before they go to the trimming room. Defective castings to be remelted should be checked and all (*Please turn to page* 204)



Above right—Transferring metal from a tilting type magnesium melting furnace to a pouring crucible. *Below*—Removing pouring crucible from holding furnace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ALUMINUM ALLOY
Die Castings

In this second and concluding article the author discusses die design and construction, design of aluminum die castings, their trimming and finishing. Recommendations also are offered on inspection and quality control and on how to set up a plant for die casting production

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AN UNDERSTANDING of the design requirements and limitations of die castings is facilitated by a general knowledge of the design and construction of the die itself. A knowledge of die construction and operation also will prove valuable to the engineer designing parts to be produced by this method. Although the die-casting process is capable of producing parts of great complexity, simple changes in design often can be made that will avoid complications and increase production.

As already pointed out, the die in its simplest form consists of two blocks of steel with their mating surfaces finished to fit closely together. A cavity of the size and shape of the part to be produced is machined into the mating surfaces of either or both blocks. A system of gates and runners must also be machined into either or both of the die halves to distribute the molten metal to all parts of the die cavity. A sprue hole is drilled through the stationary or "cover" half to introduce the molten metal from the

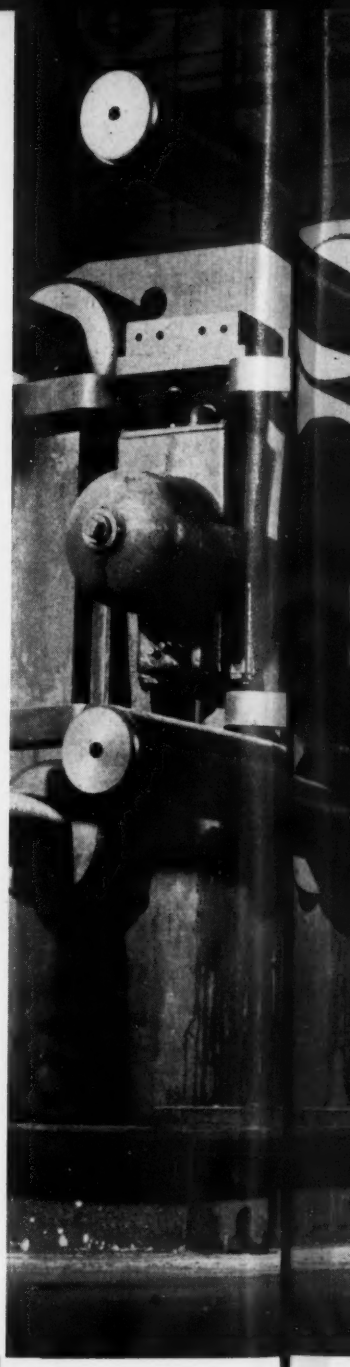


Fig. 1 (above)—Setting a large die on die-casting machine

Fig. 2 (left)—Finishing department in an aluminum die-casting plant

injection chamber into the die.

The die cavity must be designed with the parting line between the two halves so located that the casting will adhere to the movable or "ejector" half of the die when the die is opened. Since the metal shrinks as it cools, it tends to contract around projecting parts of the die impression. Therefore, the die cavity should be so designed that the parts of the die which the casting will grip as it cools are in the ejector half.

As the die halves must be locked tightly together before each individual casting is "shot," some means of venting the air inside the die cavity must be provided. For this purpose, one or more shallow channels or vents are machined into the die surface, usually in the ejector half. These are located at points farthest from the sprue hole; this prevents air from being trapped in the die cavity as it fills with molten metal. The vents are very shallow so that as soon as molten metal enters them it will solidify, preventing metal loss through these passages.

As in other types of castings, molten metal solidifies in all parts of the die cavity, including the casting proper, sprue, gates and runners, and vents. Thus the casting as it comes from the die includes all these parts which later must be trimmed off and remelted.

Dies for aluminum alloys must be given full heat treatment before even the initial casting is produced. It is highly desirable that the die cavity itself, the gating system and the vents be completely machined to as near final form as possible before heat treatment, because the dies cannot readily be altered after heat treatment is completed. Each individual casting presents its own gating problem, and since there is little room for experimenting this problem is obviously best left to an experienced die designer.

To assure dimensional accuracy in the finished casting, the two die halves must align properly every time the die is closed. To assure such alignment, dowel pins are set in at the corners of the ejector

half which fit into holes drilled in the cover half when the die is closed.

To remove the completed casting from the ejector half of the die after the die has been opened, so-called "ejector pins" are employed. These extend through drilled holes in the ejector half of the die and are mounted in an "ejector plate" at the back of the die so that all of the pins are actuated simultaneously. When the die is closed, the ends of the ejector pins are flush with the surface of the ejector half. After a casting has been "shot" and the die opened, the ejector-pin assembly is moved forward, which forces the casting out of the die. The ejector pins may be operated either mechanically (usually by rack and pinion arrangement) or by hydraulic or pneumatic cylinder, or by the action of the machine itself. They must be so located that they will not produce any undue strain that might warp or otherwise damage the casting when it is ejected.

Cores are employed to produce internal cavities and holes in die castings in much the same manner as they are used in the production of other types of castings. Like the die themselves, these cores must be made of heat-treated alloy steel. Cores that do not interfere with the ejection of the casting usually are affixed solidly to the ejector half of the die. Where castings include recesses or holes that are not aligned with the die movement, movable cores must be employed so that they can be cleared from the casting before ejection. These must be so mounted that they are locked rigidly in place when the die is closed.

Undercuts in the casting require movable parts in the die, called slides. Like movable cores, these must be locked firmly in position when the die is closed. The slides themselves may include either stationary or movable cores. Some castings which include internal undercut surfaces require loose pieces in the die which are ejected with the finished casting and are then removed and replaced in the die before the next casting is produced.

There is practically no limit to the ingenuity of a thoroughly experienced die designer. He can almost invariably find a way to die-cast the most intricate parts. It must be remembered, however, that movable cores, slides—and particularly loose pieces—slow the production rate and therefore increase the cost of the part. Often a design that is difficult to produce in its original form can be altered to eliminate the complicating features. In many instances, however, the use of complicated dies is thoroughly justified, for the die-casting of intricate parts often will reduce the total number of parts in a given assembly and thus lower the manufacturing cost of the finished product.

The production of small die castings may be increased by employing dies having two or more cavities for producing identical parts all connected together by a common gating system. Cavities for dissimilar parts likewise may be included in the same die where the same production rates are desired. The latter must be done with care, however, and is applicable only to castings having general similarity so that the same procedures will produce satisfactory castings for all of the various parts involved.

Die Casting Design—Design of the aluminum die casting itself should follow the same general principles as aluminum castings to be produced by other processes. The principal exception is that wall sections may be thinner, because the rapid cooling produced by the heavy steel die produces a structure having high mechanical strength, particularly at the surface. It is desirable that die castings be so designed as to require as little machining as possible, as machining will remove at least a portion of the tough outer skin.

Small castings having a major dimension of 6 in. or less may have walls as thin as 0.045-in. Larger castings require thicker walls—0.080-in., for example, for castings having a major dimension of 15 in. Largest castings require still thicker walls, but wall thicknesses in excess of 0.150-in. seldom are required by the casting process itself. As in other types of aluminum castings, abrupt changes in thicknesses of adjacent sections should be avoided.

Undercuts may be used where necessary, but changes in the design to avoid them are desirable wherever possible because they require the use of slides or loose pieces which slow up production.

Where added strength or stiffness is required, ribs should be used rather than increased section thickness. Ribs sometimes are added to the design of a part purely for appearance. Desirable thickness for ribs ranges between 0.7 and 1.0 times the wall thickness. Ribs should be deep enough to provide the desired strength and stiffness, but not so deep as to cause difficulty in ejecting the casting from the die.

Use of internal fillets at all corners is extremely desirable in die castings, because cracks may begin in sharp corners. Fillet radius should be approximately equal to the wall thickness, but fillets of smaller radii may be used when sharper corners are required.

Cores should be as simple as possible so as to simplify die construction, but the use of complicated cores is thoroughly justified where this will save assembly time or avoid more troublesome complications. Cored holes should conform to certain dimensional limitations. Minimum practical diameter of cored hole is 1/10-in. with a maximum depth of $\frac{3}{8}$-in. Larger cored holes may be deeper—up to 8 in. for a hole 1 in. in diameter. For through holes, cores should be supported at both ends. Long slim cores are often troublesome and should be avoided.

All die castings must have adequate bearing surfaces for the ejector pins which force the casting out of the moving half of the die. These pins leave marks on the surface of the casting and therefore should be located where such marks are not objectionable. In exceptional cases, the casting surface must be machined to remove ejector-pin marks. In general, the ejector pins should bear on the edges of the casting. Often bosses may be incorporated into the casting design for this purpose. To avoid ejection forces great enough to cause distortion, the ejector pins should be located near the points where the casting gripping forces are greatest. This means placing the ejector pins close to cores and projecting

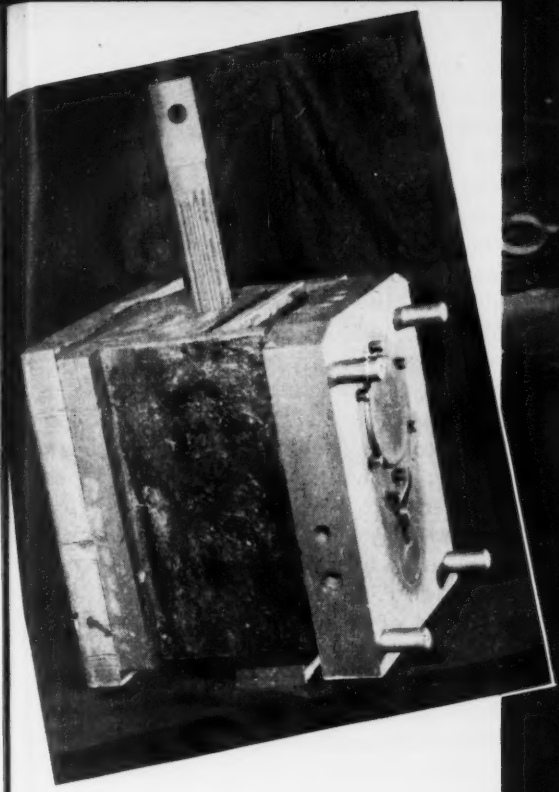


Fig. 3 (above)—Half of a simple die

Fig. 4 (below)—The impression in this die-casting die is formed by a number of carefully fitted steel blocks

Fig. 5 (above)—Dimensional check being made of a completed die

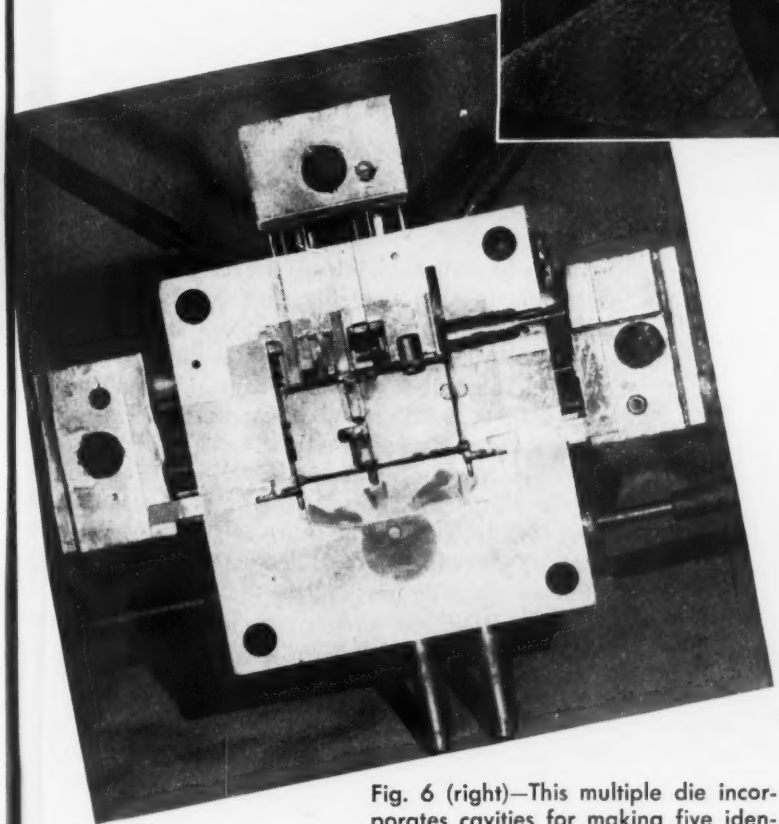
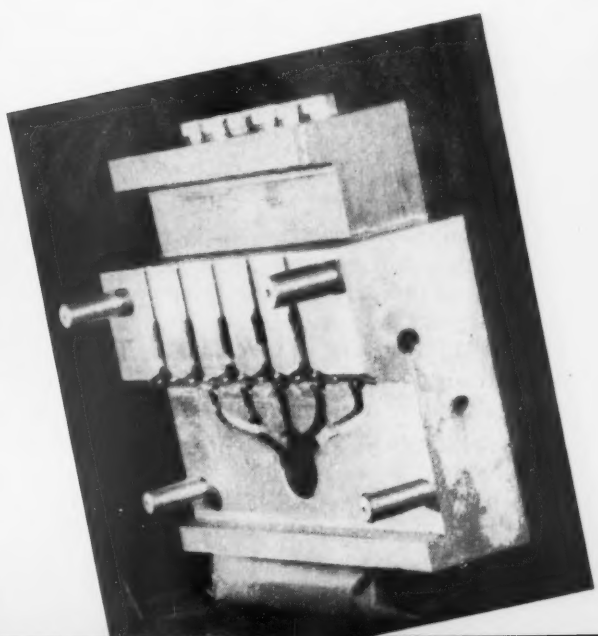


Fig. 6 (right)—This multiple die incorporates cavities for making five identical parts. Feeding is from a single gating system



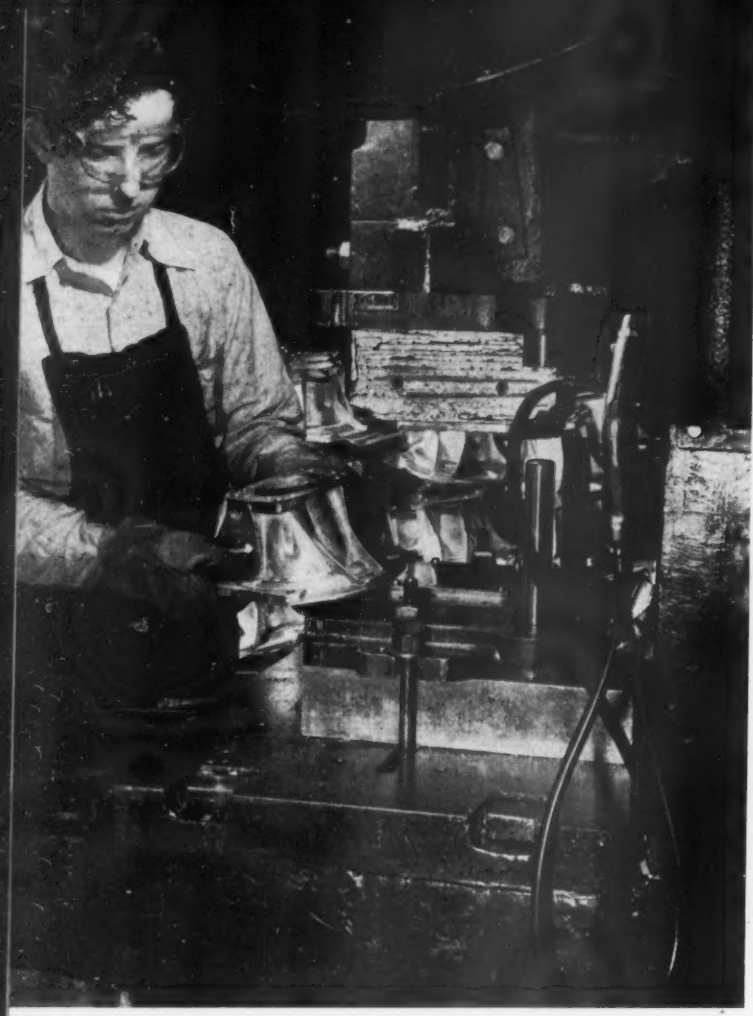


Fig. 7—Trimming flash from an automotive die casting in a punch press. Little finishing is required

parts of the ejector half of the die which are gripped by the casting as the metal shrinks during solidification.

External threads of 24 pitch and coarser may be successfully die-cast in aluminum when located on parts of the casting that are readily accessible. Die-casting of internal threads is not practical in aluminum; it is simpler to machine or tap internal threads in cored holes.

Inserts of a different metal may be incorporated into die castings where properties are required that cannot be obtained with die-casting alloys. Steel or iron inserts often are used at points requiring increased hardness, strength or stiffness. Brass or bronze inserts sometimes are used where improved bearing surfaces are required.

Where studs are required for attaching the casting to other parts of an assembly, these often may be handled as inserts. Parts of castings incorporating undercut surfaces that ordinarily would require slides may sometimes be produced as screw-machine parts and introduced into the castings as inserts. Steel hubs are often cast into gears and other rotating parts. Cast iron liners in die-cast cylinders for small internal-combustion engines are another common type of insert. Fastening devices of a variety of types may also be introduced as inserts.

Where curved passages for oil, cooling water or other liquids are required in die castings, these sometimes are provided by introducing inserts formed into the desired shape from tubing. Other inserts are cast permanent magnets in loud-speaker frames and heating elements in the sole plates of electric irons.

The use of inserts often is the simplest and most convenient way to solve difficult design problems. The casting must be designed so that the inserts are supported rigidly in the die, which means that in most cases the insert must extend through the casting wall. Inserts must be designed so that they will be firmly anchored in the castings. This may be done through the use of cast lugs, crimped projections, machined grooves, knurling, or through the use of holes which fill with molten metal when the casting is produced. It must be remembered that the use of inserts will result in slower production so that the advantages to be gained must justify the increased production cost.

Like other types of castings, die castings must have sufficient draft, or taper, to permit easy removal from the dies. Outer walls should have a draft of at least 0.5-degree (0.009-in. per linear in. of draw). Inner walls must have greater draft since these are the surfaces that grip the ejector half of the die when the die is opened.

Cored holes also must be designed with sufficient draft to permit the cores to be drawn readily. In general, the requirements are the same as for inner walls. For holes 1/10-in. in diameter (the smallest that can be successfully cored in aluminum die castings) minimum draft of 0.020-in. per in. of depth should be provided. Slightly less draft is permissible in larger holes; for example, 0.012-in. per in. of depth for holes 1 in. in diameter. For larger holes, the draft should be 0.012 plus 0.002 in. per in. of depth for every inch of diameter over one inch. The same general provisions hold for cored holes of irregular shape, where the largest dimension is the controlling factor.

Liberal draft allowance contributes to high rates of production. Therefore, whenever possible draft somewhat in excess of the foregoing minimums is desirable.

As already indicated, close dimensional tolerances are possible in aluminum die castings. On close dimensions, a tolerance of 0.0015-in. per linear in., but not less than 0.002-in. on any single dimension, may be held. Tolerances on fractional dimensions are usually held to 0.010-in. up to maximum dimensions of 7 in.; for dimensions greater than 7 in. a tolerance of 0.0015-in. per linear in. is possible. These tolerances are for dimensions entirely within one half of the die. An additional tolerance of 0.010-in. must be allowed on dimensions that depend on the relationship between moving parts of the die.

A flatness tolerance of 0.0015 times the longest dimension of the flat surface is possible in aluminum die castings.

All of the foregoing tolerance figures are the minimums that are practical to maintain on a production basis. Closer limits can be attained where absolutely necessary, but only at increased cost. It is important to specify minimum tolerances only when absolutely necessary and only for nec- (*Please turn to page* 230)

Open-hearth furnace refractories and constituents of the metal charge are discussed in this third of a series of articles covering the melting of steel for castings

Steelmaking for Castings

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Consultant

DEAD burned magnesite is prepared by calcining raw magnesium carbonate in a rotary kiln to drive off the carbon dioxide, just as lime is made from limestone. For many years, most of the magnesite used in the steel industry came from Austria, and in its natural state contained a total of about 4½ to 6 per cent lime, silica and the oxides of iron and aluminum. These impurities lowered the sintering point of the material, so that it would frit or sinter at the temperature of the furnace. When World War I cut off the foreign supply, quite pure magnesite from Nevada and Washington, and limey material from Quebec were substituted. To make these materials sinter at a proper temperature, iron ore is mixed with them in the kiln. The percentage of MgO in the dead-burned magnesite now regularly used is seldom over 85, and more often runs from 65 to 70 per cent.

Dead-burned grain magnesite mixed with a proper bond is formed into brick, or sometimes is rammed into open-ended metal containers, which are sold under the name of Metal-kase or Steel-clad brick. Magnesite bricks have an extremely high softening point, and are very resistant to attack by iron oxide and basic slags, but are comparatively weak at high temperatures, and crumble if repeatedly heated and cooled.

Principal component of chrome ore is the oxide Cr_2O_3, but its composition varies over a wide range. The material used in metallurgy contains, in addition to the chromium oxide, varying amounts of the oxides of iron, magnesium and aluminum. It is prepared by crushing and grinding, and is used either in granular form or bonded into brick. It is readily attacked by iron oxide, but is much more resistant to basic open-hearth slags than either silica or fireclay, and is less reactive toward a highly siliceous liquid than are magnesia or lime—in other words, it is nearly neutral. For this reason, chrome ore brick was for many years used as a separating course between the silica walls and the magnesite bottom brick of basic open-hearth furnaces. Today they are sometimes used also for front, back and end walls of basic furnaces. The ground ore is the standard material for ramming around the plug in making up tap holes, and is also extensively employed for patching walls and banks of basic furnaces.

In recent years, mixtures of chrome ore and magnesite have been used, both in bonded brick and in the loose granular form. The chrome-magnesite brick are stronger than magnesite brick, at high temperatures, and do not react with silica refractories to the same extent as does straight magnesite. When chrome-magnesite brick are used as foundation for basic open-hearth bottoms, it is generally considered unnecessary to separate them from the acid refractories with a course of chrome ore brick. In some basic furnaces, these brick are used for both front and back walls, instead of silica brick.

In the big steel mills, many modern basic furnaces are built with roofs of chrome-magnesite brick which melts at so high a temperature that the furnace can safely be run hotter than when the roof is of silica brick. Though stronger at high temperature than regular magnesite brick, chrome-magnesite bricks are too weak to be laid as silica brick are, and each brick must be suspended individually from the steel work of the furnace by means of a rod keyed into a slot in the top of the brick. If not maintained at high temperature, too, the bricks tend to spall and crumble. In steel foundries the furnaces cannot always be maintained steadily at high temperatures, so that basic roofs are out of the question.

In the modern large basic furnace, the back wall is not vertical, but slopes outward at a considerable angle, and is built of magnesite or chrome-magnesite brick. These "full sloping" back walls are not generally used in steel foundry furnaces, though the magnesite bricks of the hearth are often carried part way up the back walls, and the banks built up much higher than was the case in past years.

Dolomite in its raw form is the double carbonate, $CaCO_3 . MgCO_3$. It is used either single burned (calcined to drive off the CO_2) or "double burned" by heating it to some 3000° F usually with an addition of iron oxide. It cannot be formed into bricks and in the basic open-hearth furnace its use is generally confined to patching the banks. (*Please turn to page* 222)

This discussion of the properties of malleable iron castings which determine their adaptability to certain applications was presented by the author at the Market Development Conference of the Malleable Founders' Society at Northwestern University, Mar. 22-23, 1950

By DR. HARRY A. SCHWARTZ
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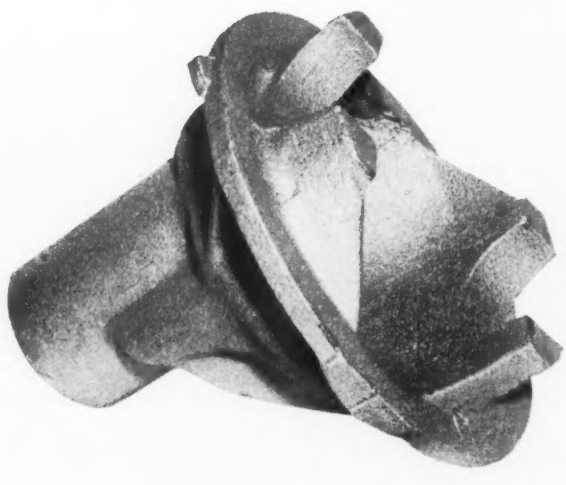
Characteristics, Limitations and Applications of Malleable Iron

MANY years ago the eminent Charles Kettering made the penetrating statement that that material was best suited to a given purpose which accomplished the required minimum of results at the least possible cost in the finished piece. The philosophy of this statement is probably not to be challenged with the possible exception that if, of two materials, one produces much more than the required minimum (including a safety factor as required) and the other just meets the minimum, the former is no doubt preferable.

Mr. Kettering's aphorism may well serve as a starting point in a discussion of what the malleable industry, or any other metal industry, has to sell. A very large major portion of the malleable founders' product enters the transportation industries. In this field the automotive manufacturer takes so large a percentage that even his share of the transportation industry business amounts to considerably over half of the demand for malleable iron. The railroads take the balance of the transportation industries' requirements; there being relatively little to be said about the marine and aviation fields. A good deal of the other portion of the malleable tonnage is used for purposes where the requirements of the material are rather similar to those in the automotive field.

Viewing the application of malleable as a material of construction, it becomes quite evident that it is valued first because it possesses very great ease of machining. In this respect it is superior to all other ferrous materials at all comparable in price and mechanical properties. In addition it has the unique characteristic that in malleable iron—not, of course, including pearlitic malleable iron—the stronger the material is made the greater is its ductility. A third rather unique property is its lack of embrittlement at low temperature, when of proper composition. Malleable iron loses a much smaller fraction of its room temperature impact strength when cooled to arctic temperatures than do most of the competitive materials. Nickel steels and some of the stainless steels constitute an exception. Thus if an object is sufficiently impact resistant at room temperature when made of either malleable iron or a competitive material, when the temperature falls to say 80° below zero, the malleable part will be less likely to fail than the competitive part.



Being cast to form, malleable iron should have increasing advantages the more complex its shape considered in the final product. It is here that the malleable founders' industry could perhaps greatly benefit itself by intensive effort in the direction of gating and feeding. There is a considerable tendency in the hand book and elsewhere to press for simple forms. The simpler the form the easier is the competition on the part of the rolled or forged products and even

for approximately similar items in cast steel.

In this connection a personal experience may be of some interest. About the period of World War I the magnetic circuits of automotive generators and starters were commonly made of malleable iron. Originally the usual design consisted of a hollow cylinder from which projected inwardly two or more—usually four—pole pieces. The cylinder was closed at one end by an integral end piece carrying one of the armature bearings. It was possible to machine this entire assembly by a simple boring operation, which at the same time bored the bearing seat and the inner ends of the pole pieces to concentric cylindrical form and at the same time turned the pilot seat in the open end of the casting. By a single operation a malleable end plate could be perfectly centered in this pilot, and have a hole bored concentrically for the other end of the shaft.

Castings

Since it was necessary to eliminate shrinkage completely in the interest of low magnetic reluctance, rather ornate foundry efforts had to be made to be sure that the pole pieces were fed solid where they joined the cylindrical frame. Presently the plant which made them persuaded the manufacturer to bore out the cylindrical inside surface of this frame and fit in the pole pieces separately with some lack of electrical efficiency. Having accomplished this the next step was to persuade them to make both end plates removable instead of only one, at an increased machining cost. Thereupon he woke up to the fact that what remained was merely the hollow cylinder, which he could make easily by lap welding a strip of soft steel, and the plant lost the entire business.

There are, of course, limitations to what the foundryman can make, but too much of a drift in the direction of simplicity will lose him business.

The question of what the foundryman can cast is reflected in the two ASTM grades of malleable iron. The 32510 grade has some machinability advantage over the 35018 grade. Its disadvantage as to strength is, for most purposes, of no consequence. The limiting minimum thickness of malleable castings is, in almost every case, a foundry problem. It is impossible to cast objects so thin that the 50,000 psi tensile strength of the former grade will ever fail. An increment of tensile strength does not imply a decrease in weight because it becomes no longer possible to make the object thinner to take advantage of the additional tensile strength.

Because the relatively high carbon 32510 grade metal is easier to cast, lends itself better to continuous foundry operation, is more machinable and in any event is more than adequate to take imposed stresses, it is gravely doubtful whether there is, except in rather specialized cases, any good reason for making a structural part of the 35018 material.

Certain purchasers require that even pipe fittings be made of the 35018 or railway grade of malleable iron. The author has no personal contact with the pipe fitting business but he was shown data by a highly respected metallurgist in this field indicating that castings made from the same patterns leaked at lower pressures when of the 35018 grade, than when made of cupola malleable as is the almost universal practice. Since the object of a pipe fitting is only to keep the contents inside it from coming out, this would seem to represent a clear case where the stronger metal was less suited to the intended purpose.

Specifications Cause Trouble

The question of published or quoted specifications is a very frequent cause of trouble. As salesmen you want to make the best case possible for your product. Therefore, you will be tempted to say that the properties of your product are the average values obtained in the plant. Whoever writes your advertising will be even more anxious to say something like that, or worse.

Now your customer does not care at all what your average value is. He wants to know what value he can use in design and be sure that this will be obtained with so few exceptions that the effect will be insignificant and that no failures in detectable amount will occur.

I do not want to seem too technical in this connection but the only way to describe the quality of a product in figures is to give its average value and a statistic called "standard deviation." The standard deviation of a quality is a measure of its scatter. It is assumed for many purposes that values falling more than three times its standard deviation from the mean value will occur so infrequently as not to justify consideration. You will then have to guarantee a minimum value no higher than your average value less three times the standard deviation. Thus if the standard deviation of tensile strength in your plant is 1000 psi, the average value will have to be 53,000 psi if the required minimum of 50,000 psi is never to be passed. (*Please turn to page* 236)

Olivine Sand

Experiments by the University of Washington with an olivine-base synthetic molding sand are described here. Scarcity of silica sand deposits on the West Coast, coupled with presence of large deposits of high-quality olivine rock in the state of Washington, prompted the investigation

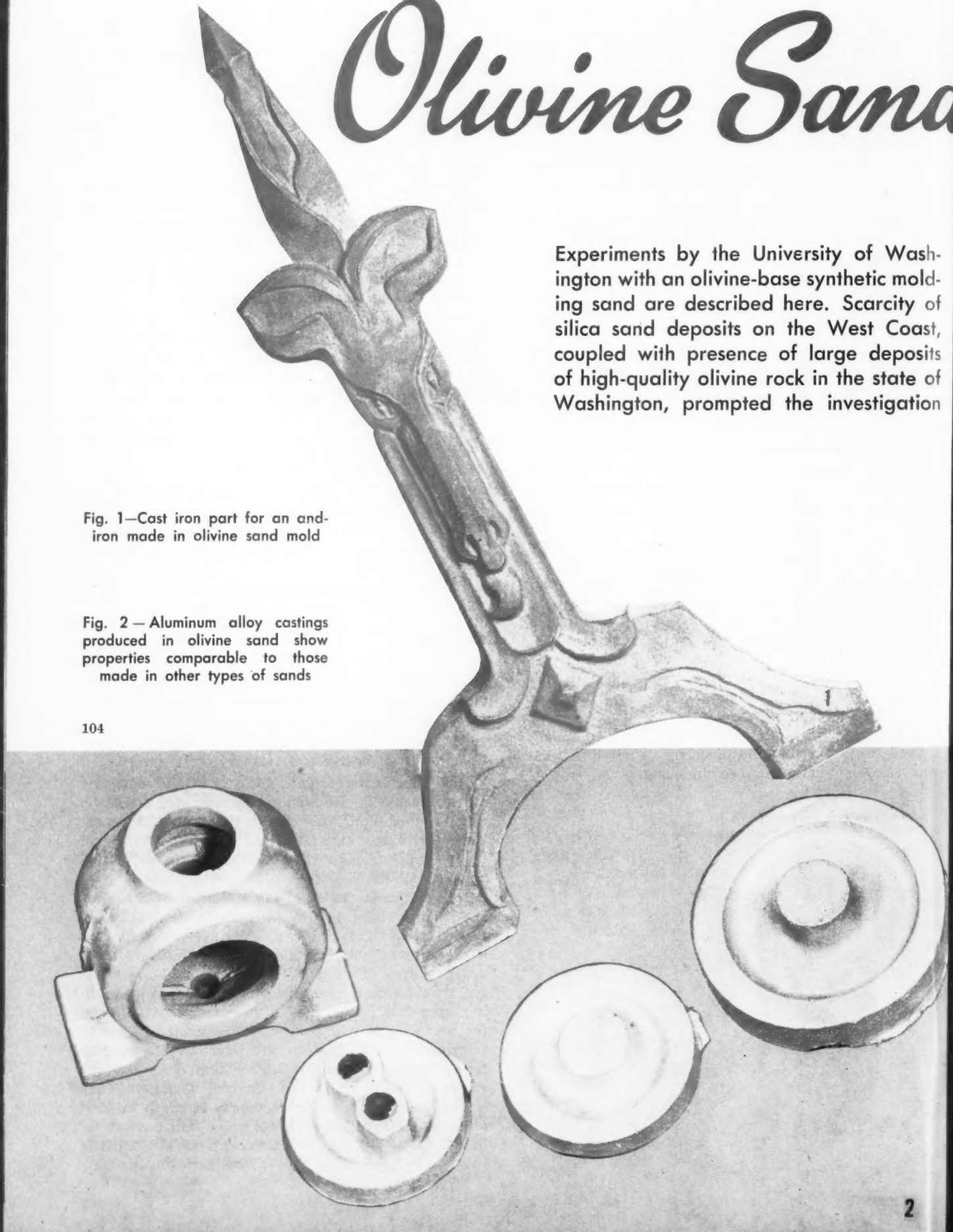


Fig. 1—Cast iron part for an andiron made in olivine sand mold

Fig. 2 — Aluminum alloy castings produced in olivine sand show properties comparable to those made in other types of sands

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Research

PROGRAMS conducted for a considerable time to investigate molding sands have resulted in major improvements in foundry sand practice. No longer is there any question that a properly organized foundry sand program is desirable in any organization seeking quality in its castings.

During this development, natural foundry sands have been given serious competition by synthetic sands. This is a natural evolution since, in synthetic sands, mechanical as well as physical properties can be controlled more closely.

Synthetic sand development was accompanied by intensive study of various bonding agencies. Results have been gratifying, as evidenced by the amount of synthetic sand currently in use. Perhaps it would be interesting to note that throughout the many years of molding sand research, little has been done in studying the aggregate of foundry sand.

Because silica has been a rather satisfactory aggregate material little research has been directed toward it other than in such matters as grain shape and grain size. Since an imposing amount of information has been developed about silica it is questionable whether a research project to replace this established material should be undertaken.

Refractory properties of natural olivine rock have been understood for many years. In 1938 some investigation work was undertaken at the University of Washington in connection with developing olivine molding sands. These studies were of an exploratory nature and were not pursued with diligence, due primarily to the pre-eminent position of silica, and further because of economic conditions favoring silica.

The economic situation has changed in foundry sands as in most everything else. West coast foundries are dependent primarily on Ottawa silica sand or imports from Belgium. This seems a rather anomalous situation in view of the West's mountainous terrain coupled with a magnificent sea coast. While there are some silica deposits, they are separated and isolated, so there is no substantial silica sand industry on the West coast.

Large deposits of high-quality olivine rock are present in the state of (*Please turn to page* 168)

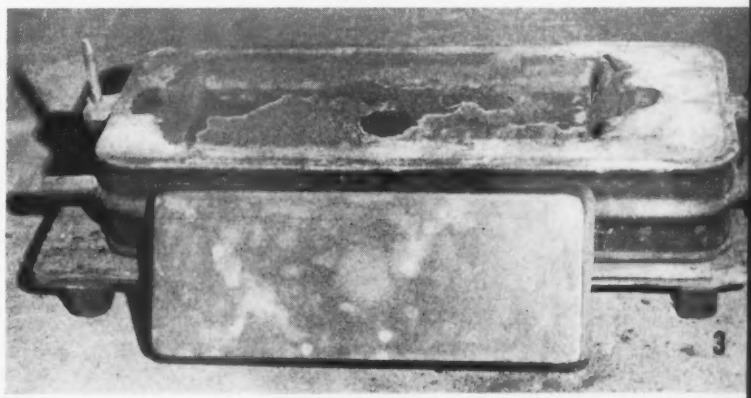
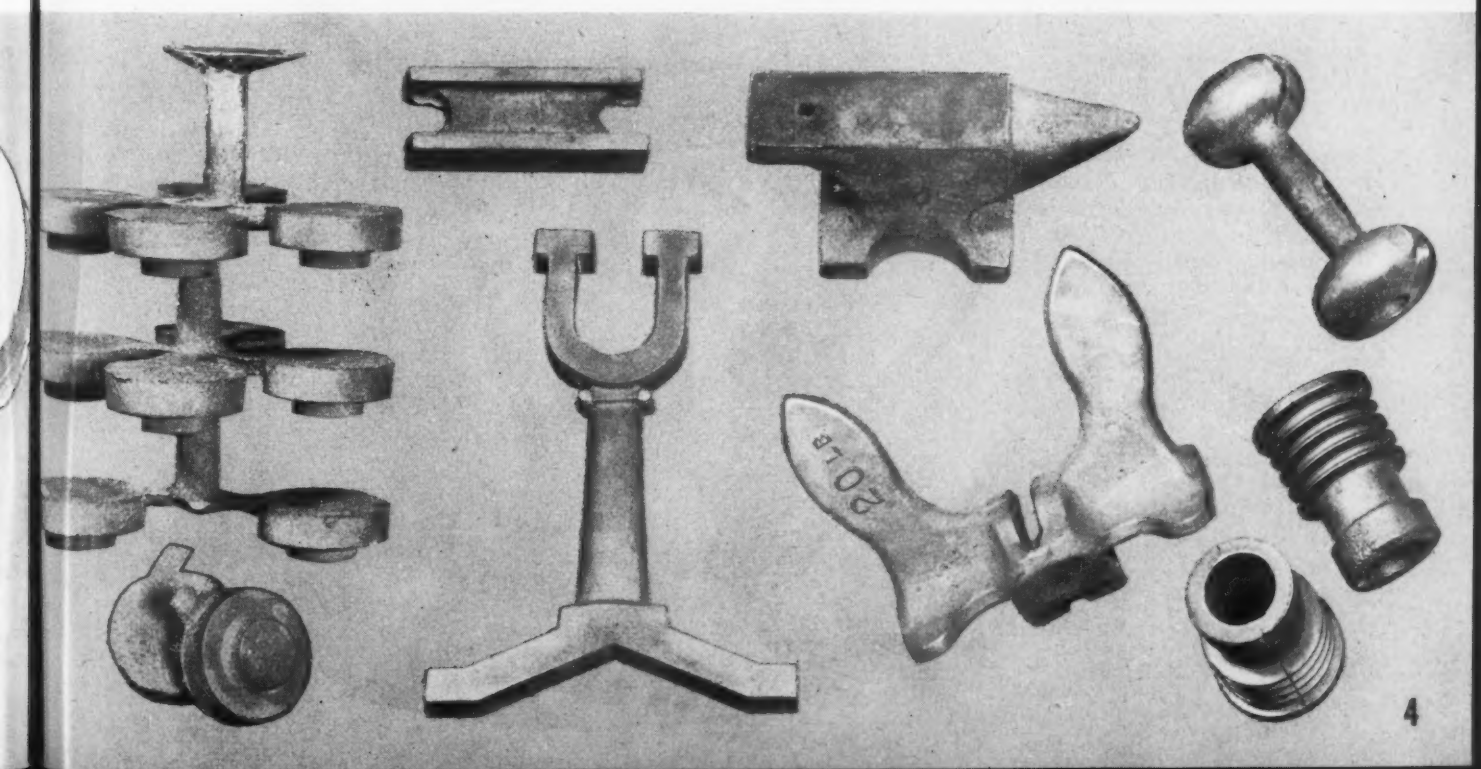
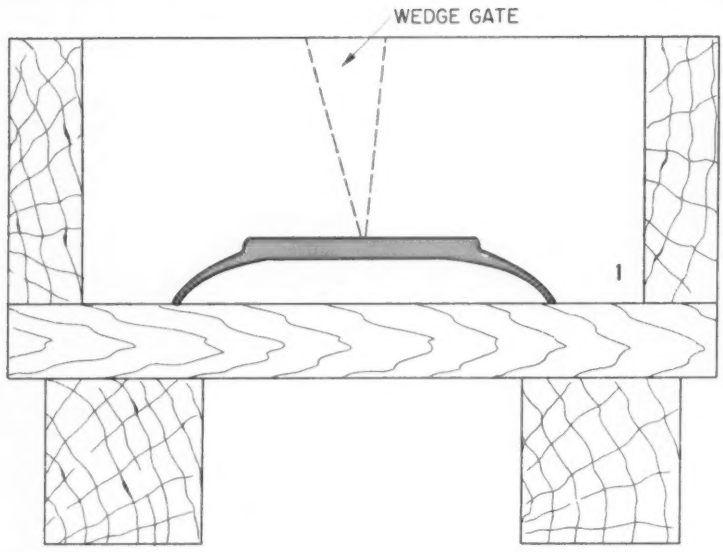


Fig. 3—Test casting made during investigations to determine effect of various mold washes on sand

Fig. 4—Representative gray iron castings made by students in studying use of olivine sand for molds





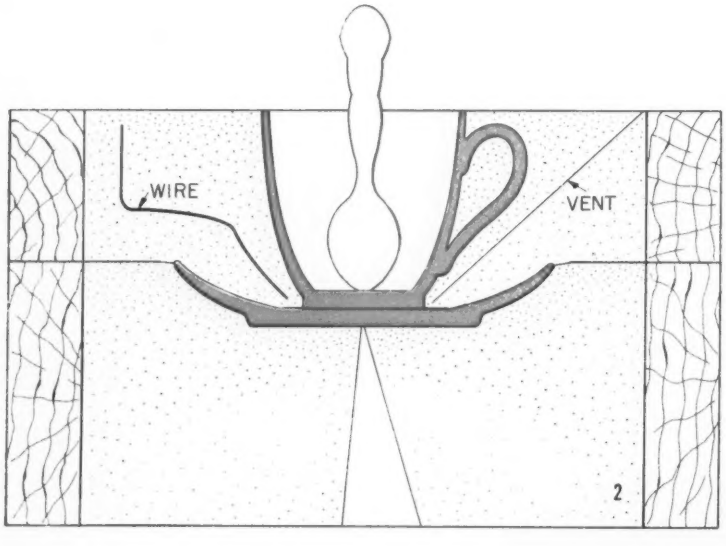


Fig. 1 (top) — The cope is rammed first. Fig. 2 (bottom)—Cheek rolled over and cheek flask set in place. Reinforcing wires are shown at left and vents at right

The Cup
Saucer
...and

For many years the cup, saucer and spoon casting has been accorded a certain degree of respect by skilled molders, because its production requires no small amount of dexterity. In former times the apprentice able to make this tricky one-piece casting without assistance was considered fit to travel. The various steps in forming the mold are explained here

a Spoon

By PAT DWYER
Engineering Editor
FOUNDRY

NEARLY every molder at one time or another in his career has heard of a peculiar casting in which an ordinary teacup, a saucer and a spoon are cast in one piece, the cup sitting in the saucer and the spoon standing up in the cup. The tradition is as familiar to machinery molders as it is to those engaged in the stove plate and hollow-ware branches of the trade.

As naturally might be expected, more actual castings have been made by men and boys engaged in the stove plate and hollow-ware shops. Old timers will remember that when an apprentice turned out one of these castings under his own power and without any coaching from the audience, he was considered fit to travel. To a modest extent the feat was equivalent to taking a degree *cum laude* from one of the more elevated seats of learning.

Sand in stove plate, hollow ware and brass shops is adapted to the production of thin intricate castings, and the men are accustomed to delicate manipulation. The old-time all-around molder usually had opportunity to turn his hand to all branches of the trade. In recent years with increased production and specialization, a more or less well defined line of demaration has been established. A man usually follows one line or another.

The casting may be molded in a small snap flask, but a small special wood flask about 7 x 7 in. is preferable. On account of the thin metal section in the casting it is essential that the flask pins fit closely and accurately. The mold is made in a good grade of fine sand similar to that usually used in stove plate and brass shops. Fine sand is necessary to produce a smooth surface on the casting, to obviate parting line marks and to supply the required strength in the three drawbacks so that they may be handled with comparative safety. Even under the most favorable conditions a light deft touch is required for this latter feature, a touch that is acquired only after considerable practice.

One drawback is between the back of the spoon and the inside surface of the cup. The other drawback is in two parts on the outside of the cup and is designed to facilitate the removal of the cup handle from the mold. Sand in the mold is rammed to a fair degree of density, but not hard. This is rather a difficult point of information to convey, especially to any person who has had no actual experience in ramming sand. In a general way it may be said that the sand is rammed in the same manner that sand is rammed for hollow-ware castings. Perhaps a better definition would be that the sand is rammed just sufficiently hard to hold its shape during manipulation of the mold in the formative stages and afterward while it is being filled with molten metal.

Various successive steps in forming the mold are shown in the accompanying illustrations. They may not be as complete and illuminating as a slow-motion film but they cover the subject in a fairly satisfactory manner.

In foundry parlance the mold is rolled over twice. This is not strictly accurate since only one part of the mold is rolled over twice. The cope is rammed first and rolled over, the cheek and drag are rammed on top of the cope and then the three parts are rolled over together, thus bringing the cope to its proper position on top.

In the beginning the saucer is placed concave side down on the rollover board as shown in Fig. 1. The cope part of the flask is set on and the gate pattern is adjusted upright on the center of the saucer. Gate style is optional. It may be either round ½ in. in diameter or the flat wedge shape about 2 in. wide usually employed on stove plate and hollow ware. The wedge gate is shown in the illustration. With proper precaution one gate will distribute the metal as well as the other. Also one will break off as cleanly as the other from the casting.

However, under ordinary working conditions, the round gate has a tendency either to break into the casting, or leave a small stump. Since the flat wedge gate rarely presents either of these objectionable features, it is preferred by molders working on light castings. If it is not adjusted properly it will create just as much trouble as the round gate and in the same manner. That is true of any step in the process that is handled carelessly, or without special skill and knowledge.

Sand is sieved on the saucer pattern and banked up around the gate pattern to hold it firmly in place. The cope is filled with sand, rammed, struck off flush with the upper edge of the flask, fitted with a board

and rolled over with the gate stick still in place. The joint is brushed clean and sprinkled with parting sand. The cup and spoon are placed in position on the saucer, followed by the cheek part of the flask as shown in Fig. 2. Sieved sand is tucked with the fingers into the acute angle between the rounded lower part of the outside of the cup and the saucer. Remainder of the space between the outside of the cup and the flask walls is rammed full of sand and struck off flush with the upper edge of the cheek. During the ramming period a number of small wires are bent and inserted in the sand as shown in Fig. 2. These wires, from ¼ to ½ in. apart, reinforce the sand in the delicate section indicated, when the mold is filled with molten metal.

If the cup is not as deep as the flask, a parting is made from the edge of the cheek down to the rim of the cup. If the cup is deeper than the cheek, the parting line will run down from the rim of the cup to the edge of the flask. However, neither of these conditions are present where the small special flask is employed.

After the general parting is made in the form of a flat surface, two points are treated in a special manner. A small mound of sand is built with the fingers on the under side of the spoon, and a hollow is scooped around the cup handle. A small sand mound also is built up under the spoon handle where it projects above the cup. This step is shown in Fig. 3. One or two nails are driven in the small mound of sand under the spoon handle to reinforce it and insure that it will *lift* when the drag is lifted off.

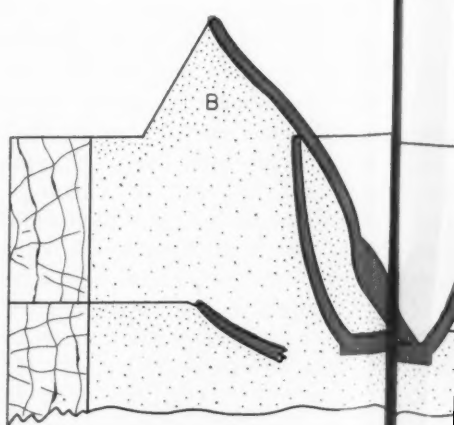
The surface of the hollow around the cup handle is covered with wet parting sand or any other parting medium. One half the hollow is packed full of sand and a vertical parting is made along the center line of the handle inside and outside. This surface is covered with wet parting sand and then the remaining half of the hollow is packed full of sand. At this stage some molders provide a means for handling the two half drawbacks later. A piece of cardboard, paper or tin usually is employed.

With the exception of one straight line where the edge of the tin coincides with the vertical parting line, the remaining outline of the tin need not conform to the shape of the drawback base. So long as it covers the entire surface is all that is required. A due regard for the proprieties and the pride any craftsman takes in neat appearance will prevent him from employing a great unwieldy piece of tin. Each piece of tin is smeared lightly with paste on the contact side and pressed down gently on its respective half draw back. The precaution is not actually necessary. With any kind of a thin tool, a man can separate the two half drawbacks, and slide them each a little to one side to clear the cup handle. That step does not come until the mold has been partly disassembled. Shape, size and position of the two half drawbacks are shown at *C* Fig. 3.

One of the most delicate steps is arranging the small body of sand under the spoon in the cup in such a way that the spoon may be removed at the proper time. Sand is packed between the spoon and the inside surface of the cup. It is advisable to reinforce the delicate body of sand with a few pieces of wire or long thin finishing nails. This little bit of sand is responsible for nearly all the lost castings. It is apt to sag after the spoon pattern has been removed and thus shut off the cavity destined to receive the metal. It is advisable to use all new sand since new sand is *stronger* than sand which has been used.

A flared parting is made around the spoon bowl and part of the handle. After this sand mound has been covered with parting sand or any other parting medium, a handful of sieved sand is placed in the bottom of the cup. Four 6-in. spikes (Fig. 4) are placed cross fashion upright in the sand to serve as lifters. The drag is set on and rammed full of sand. Some varieties of sand require no venting, but usually it is advisable to vent the drag, down into the cup with a wire, also the sand between cup and saucer, as at right, Fig. 2. A few vent holes may not be actually necessary, but certainly they will do no harm.

The drag with the suspended body of sand from inside the cup is lifted off and laid on the bench in an inverted position. A small opening is cut through the small mound of sand in the cup, commencing at the point where the point of the spoon comes into contact with the cup and extending back approximately ¾ in. This opening provides a passage for



the metal. Otherwise all the metal to form the spoon would have to enter at the lower opening where the spoon touches the rim of the cup. The parting surface is smeared lightly with paste to anchor the small body of sand to the larger body forming the interior of the cup, and to prevent the small body from floating when the mold is filled with metal. At this stage the spoon is removed from the mold.

The drag then is returned to place and the entire mold is rolled over. The mold now is complete and it remains only to take it apart, remove the cup and saucer, reassemble the mold and fill it with metal. The cope, with the gate pattern still in place, is lifted off and placed on the bench. The molder runs a small tool, a small double ender or a *Yankee Slick* along both sides of the gate where it comes in contact with the pattern. The heel of a lifter or the point of a trowel may be employed for the purpose if neither of the other tools is available, but practically every molder has one or both of the first-mentioned tools. They are the most convenient and suitable. Purpose of the slicking is to firm the edges of the gate and prevent the sand from washing while the metal is passing into the mold. After the sand has been slicked and, if the occasions seems to warrant, swabbed lightly, the wood gate pattern is removed.

The saucer pattern may be removed from the cheek by one of several methods. Of course it cannot be removed in the usual manner by inserting a screw or spike. In the somewhat remote event that the molder is blessed—or cursed—with long finger nails, he can insert the points under the edge at opposite points and lift the saucer in that manner. He can slip the point of a finishing trowel or double ender, or even the heel of a small lifter under one edge and tip the pattern high enough to grasp with the fingers. Probably the neatest method is to moisten a lump of clay and press it against the bottom of the saucer. When the clay is lifted the saucer will come with it. The cheek of the mold then is lifted and placed on the bench.

The feather edge around the base of the handle drawbacks is cut away, partly because it would crumble during removal, but principally to afford an opportunity to cut a light mark in the drag face to serve as a guide in returning the half drawbacks to the original position after the pattern is removed. The point of a thin tool is inserted at the back of the drawback in the center and one half is pushed gently ½ in. to one side. The second half is pushed away from the other side. With the handle exposed and clear the cup may be removed. It is tapped gently to prevent the small body of sand under the spoon from adhering.

After the cup has been removed the two small drawbacks forming the handle are moved back into their original position. The cheek is replaced, followed by the cope, and after a weight has been placed on the cope, the mold is ready for the metal. The metal is poured gently to prevent it from raising the thin overhanging circle of sand in the cheek.

In the interest of smoothness and accuracy it may be considered desirable to attach the two handle drawbacks to the cheek after the pattern has been removed, instead of sliding them forward to their original position on the drag. The only advantage of this procedure is that the joint may be slicked over and in that way the face of the casting will present a perfectly smooth surface. Objection to the method is that it is a hazardous undertaking and may result in loosening some of the sand in the cheek. In addition to the reinforcing wires shown at the left in Fig. 2, the thin circle of sand between cup and saucer may be strengthened by swabbing or spraying it with molasses water or other water soluble binder, and then drying it with a torch.

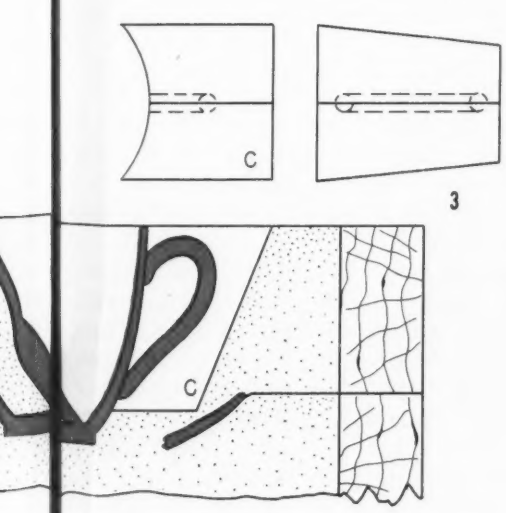


Fig. 3—Sectional and top views of handle drawbacks, also (left) cheek parting lines

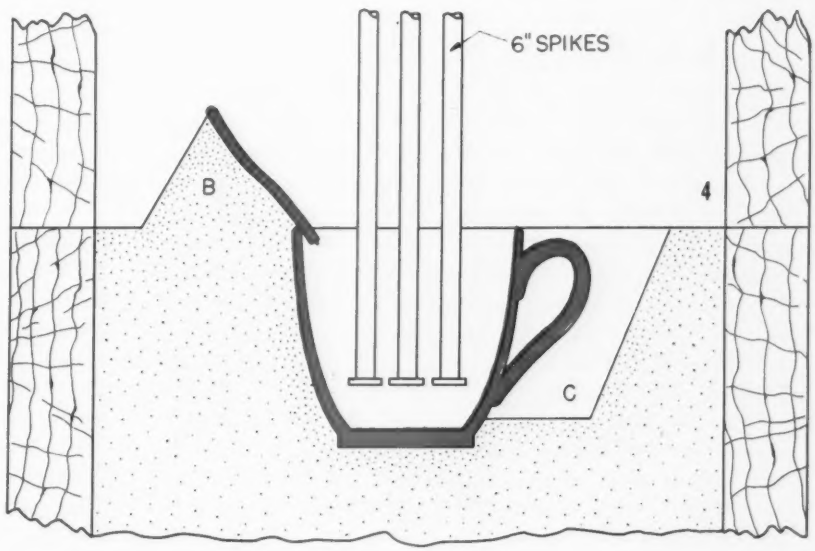


Fig. 4—Spikes in the drag carry sand from inside the cup when the drag is lifted off

QUESTIONS and A

Material Too Light for Purpose

Q.—We are seeking information relative to use of various types of cleaning agents which can be used in centrifugal abrasive blasting machines. We understand there are now on the market such materials as corn cobs, rice hulls and other soft materials which can be employed in such machines for cleaning small castings and result in smooth finishes without destroying critical sharp edges.

A.—Materials such as ground corn cobs, rice hulls and similar substances are used to a considerable extent for deburring or removing the sharp whiskers left after drilling holes in small parts, and also for removing grease, burned-on carbon, etc., from automotive and airplane engine parts on overhaul inspection. However, we believe those materials are used with air-operated blast equipment. Whether they could be used in a centrifugal type machine is another matter, but it is our impression that the materials are so light that insufficient velocity would be developed to do much cleaning.

Possibly you could try what is termed "copper" shot. It is being employed to clean nonferrous castings of the copper-base type. It is softer than the usual ferrous materials or sand, and imparts a fine finish. Another method for providing smooth finishes with little if any cutting action is blasting with fine abrasive material suspended in water which is recommended for finishing the faces of dies, etc.

No Standard Facing Sand Mix

Q.—Can you give us the best mixtures for facing sands for light, and heavy steel castings? Also can you supply information on cement bonded sand?

A.—Like many other practices in the foundry industry, each foundryman considers his particular facing sand mixture or mixtures to be the best for the work in hand. Aim, of course, in compounding a facing sand is to obtain as smooth a surface on the casting as possible without running into trouble from blows, etc., and have the sand peel cleanly from the casting. In general the practice is to use all new sand or large amounts of new sand in combination with system or backing sand bonded with about 5 per cent bentonite and 1 per cent cereal. New sand is that regularly added, but in some cases it might be advisable to add a finer sand to that in forming the facing. You will have to experiment until you obtain a satisfactory combination.

As to cement-bonded molding sand, Hall in the September, 1950 issue of FOUNDRY states that a 45 to 55 AFS grain fineness silica sand (new) with 13 per cent high-strength cement and 6 per cent moisture serves for the facing while old sand (crushed and ground) mixed with 10 per cent cement and 7 per cent moisture is suitable for the backing sand. Molds are air dried for 72 hours before pouring.

Must Meet Double Requirement

Q.—We are producing small bronze castings used in textile machinery which must possess close tolerances as well as smooth surfaces. Present sand shows a permeability of 5.1, green compression strength of 9.4 psi, a clay content of 21 per cent, and an average AFS grain fineness of 231. We are sending you a specimen casting which has a satisfactory finish. However, the tendency of the sand we are using is to expand, resulting in oversize castings, and when rammed too hard, blows occur. We have tried zircon sand which we use for a gray iron casting of the same type, but the surface is rough. We wonder if we could obtain the desired finish by use of silica sand with the necessary bonds, etc. It is our impression that most brass foundries employ naturally bonded sand, and wonder how far we could go with a synthetic sand by starting out with a silica grain of a given fineness.

A.—It appears to us you would be much better off to use plaster of paris or gypsum as the molding medium. We do not doubt that a synthetic sand could be developed for making the castings, but considerable experimental work would be involved. It might be pointed out synthetic sands generally are used where closer control of their characteristics is desired than can be obtained with natural sands.

With synthetic sands the grain size and, more important, the grain size distribution as well as the type of bond and moisture content for a given set of conditions can be adjusted to meet requirements. Where fireclays are used as the bond, the moisture content will be in the range of natural molding sands of about 7 per cent while if bentonite is the bonding agent, the moisture is around 3 per cent.

In your case, instead of using one sand for the complete mold, it would be better to use a fine facing sand next to the pattern, and a coarser, more open sand for the remainder of the mold. While that method requires an extra operation, we believe that it will hold troubles from blows to a minimum since the coarser backing sand will permit the escape of gases more readily. Perhaps even now you can apply that practice—use the fine sand you describe as a facing, and back it up with a much coarser sand. Naturally, the facing should be applied as thin as possible so that the barrier to the escape of gases is minimum.

In selecting the base sand for the synthetic type, it will be advisable to try to work to the coarsest one possible to obtain the highest permeability and

Answers

freedom from blows. With a grain distribution over at least three sieve sizes better surface finish is obtained as the finer grains fill in the interstices between the coarser ones.

High clay content of the sand you are using might lead to use of high moisture content since the clay will hold more water without giving any outward indication—by feel, for example—that it is on the high side. That may be a point worth looking into since the lower the moisture, the less steam is generated. Also it seems to us that a considerable amount of coarser sand could be added to open it up without affecting surface smoothness. However, careful experimental work with small batches would have to be done to determine that point as well as the quantities and grain sizes.

Straightening Warped Castings

Q.—Occasionally in a batch of long, narrow castings we find one or two warped to some extent. All these castings are molded, gated, poured and shaken out in the same manner. Can these castings be straightened?

A.—When one of these warped castings in any length up to 17 ft appears in a prominent textile machine foundry, it is straightened in a comparatively simple manner by placing it convex side up on two wood blocks about 8 ft apart under a pneumatic press. The press plunger forces the center below a straight line. When the pressure is released the casting springs back to a straight line. Experience of the operator guides him in determining the amount of deflection necessary. Usually the casting is bent while cold, but in extreme cases, for instance where the casting has warped ¾-in. or more, it is heated to a dull red by an oil torch before the pressure is applied.

While it is true that the entire sequence of operations is similar for all castings, and theoretically the schedule is perfect, it is reasonable to assume that a slight deviation in one link of the chain is responsible for the warp. Suspicion based on experience points toward the method of shaking out the castings. When one side of a casting cools before the opposite side, it will contract and pull. The most familiar example is a plate poured in an open sand mold. If the upper face is left exposed to the atmosphere, it will contract and the ends will spring up.

A possibility exists that the majority of your castings either were left in the molds for a considerable time until contraction practically had ceased, or the castings were shaken out in a manner that left them buried in the sand until they cooled. Alternatively they may have been shaken out while still red hot, and placed in position where the air could circulate around them. The copes from the warped castings probably were removed, but for any one of several possible reasons, the exposed casting was not removed from the drag for some time. This treatment would cause the ends to spring up and the result would be a warped casting.

Core Acts To Create Hot Spot

Q.—Will you tell us briefly what a "Washburn" core is, and whether it ever has been applied successfully in bronze and aluminum castings?

A.—The Washburn core is one of thin section interposed between top of the casting and the riser, and contains a small central hole which is about 20 to 25 per cent of the cross-sectional area of the riser. While it is being used on steel and gray iron castings, according to Brinson and Duma in an article "Knockoff Risers for Nonferrous Castings" in *Transactions*, American Foundrymen's Society, 1946, it is not so successful with nonferrous castings. This is attributed to the fact that not enough heat is developed in the core to form the necessary hot spot to keep the metal liquid at that point.

The authors recommend metal screens or graphite disks. The metal screen is that type used in gates of magnesium and aluminum alloy castings—usually tinned sheet steel about 0.0125 to 0.015-in. thick containing 100 to 144 openings 0.032-in. in diam per square inch. The graphite disks range from ⅛ to 5/16-in. thick; the ⅛-in. thickness for risers up to 6 in. in diam, 3/16-in. for 6 to 10 in. diam risers, and ¼-in. for 10 in. diam up. The graphite disks are not recommended for risers less than 3 to 3½ in. in diam. Brinson and Duma also mention that tinned screens

GANGWAY! By J. A. PATTERSON

"See here—what brings all you men up here to the office?"

QUESTIONS *and Answers*

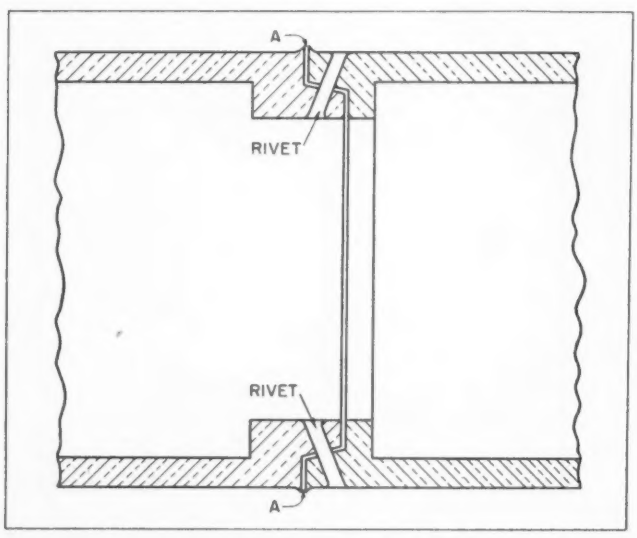
are not too successful with bronzes. However, Myskowski states that plain steel screens oxidized by heating to 1000°F for a short time are not wetted by molten bronze, and can be used.

Roman Joint Is Old and Good

Q.—What is meant by the term "Roman joint" which we notice occasionally in foundry literature.

A.—In statuary casting the term "Roman joint" is applied to the peculiar form of joint adopted to join one part of the casting to another part. Majority of large castings are molded and cast in several sections which afterward are assembled in a complete figure. Manifestly it is impossible to cast these various parts so that they will fit together without showing the joint lines. Since joints, however slight, would detract from the appearance of the finished object, the patterns are designed to conceal these joints and also to provide a means for anchoring the parts to each other.

An example of this type joint is shown in the accompanying illustration. It was used by ancient Roman craftsmen and, strange as it may seem, no better or more satisfactory type of joint ever has been developed. In the foundry statuary molding still is carried on substantially as it was in the days of the Roman empire when the art reached a high state of perfection. Briefly, it is a male and female joint with a slight ridge at the adjoining edges. After the parts are fitted carefully, two or more rivets are driven into place to hold them together. Then the ridges are hammered down. The comparatively soft metal flows readily and fills the crack. Excess metal is filed or scraped or ground away to leave an unbroken metal surface. When the work is done skillfully it is impossible to detect the joint. In recent years the welding torch has been employed to a considerable extent to join the parts in statuary and other ornamental castings.



Ridge A is hammered down and filed smooth after the parts are riveted together. The joint is hardly perceptible

Casting Not Fed Sufficiently

Q.—We are casting brass containing 67 per cent Cu, 0.80 per cent Sn, 2 per cent Pb, 0.30 per cent Ni, 0.30 per cent Fe, remainder Zn with the addition of ½ lb Pb and 3 oz Al per cwt just before pouring. We are having trouble with a spiderweb effect on the highly polished face of the castings as may be seen in the accompanying sample of a lock escutcheon plate. Can you tell us what is wrong, and how we can correct it? Pouring temperature is 2180 to 2200°F in bottom-pour crucible, pit-fire. Sand tests show moisture 7.0 to 7.4 per cent, permeability 30 to 35, green compression strength 14 psi, mold hardness 65 to 80. We also are enclosing samples of sprue, gates and runners.

A.—Superficial examination of surface of the casting, coupled with the fact that you are using aluminum additions to the brass, indicate the possibility of aluminum oxide inclusions. However, closer study of the rather aptly described "spiderweb" effect under the magnifying glass showed that it consisted of a maze of very fine cracks. This, plus the fact that the location is at the point where the casting section is heavier than in adjoining parts suggested the trouble might be due to shrinkage.

Fracturing the casting across the section in question verified that surmise since the structure was coarse and open, showing the well-known dendritic or pine-tree formation as well as a lemon-yellow color. Adjoining section was uniformly fine grain with the usual pinkish color. Elimination of the trouble probably can be accomplished by adding another gate leading into the casting at the section where the defective area appears. However, that means additional work in sawing off the gate, and before putting on another gate we suggest you try increasing the size of the present gate—at the point where it is attached to the runner. At that section it is about 1 x ⅛-in., and we suggest increasing the thickness to ¼-in.

Incidentally, it appears that the runner used is extremely large and a needless luxury since it permits not much more than a 40 per cent yield. We believe that the castings can be successfully run with only the section in the drag half, and compacting it so that the least surface area is exposed; that is, make it 9/16-in. square instead of ⅞ x ⅜-in. Gates to the castings could be ¼-in. square at an angle of about 30 degrees as you have them now without the curved arrangement. Pouring uphill also might help. Yellow brass should be forced into the mold cavity as quickly as possible, and the gates should be larger than for red brass.

Also your pouring temperature is about 100°F higher than usually employed for yellow brass. Hudson states that a pouring range of 1922 to 2102°F for light to heavy castings, while the American Foundrymen's Society *Sand Casting Practices for*

(*Concluded on page* 114)

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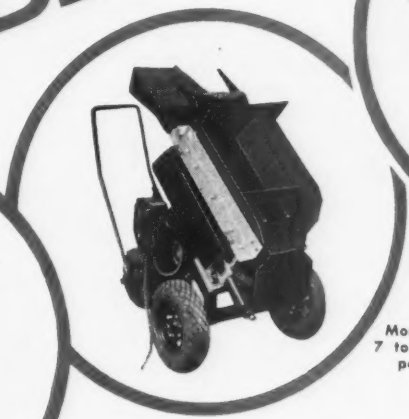
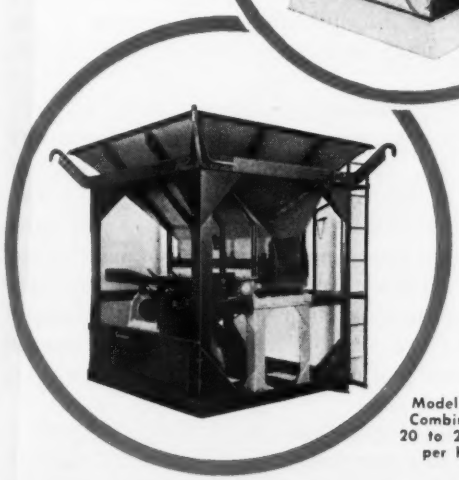


Model NB-4
7 to 9½ tons per hour

Model NC-2
12 to 15 tons per hour

Model NDP
20 to 25 tons per hour

Model NRS
40 to 50 tons per hour



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QUESTIONS *and Answers*

(*Concluded from page* 112)

Nonferrous Alloys recommends an average of 2050°F, pointing out that with high temperatures more zinc fumes are produced. We believe that you can use a much finer sand than you now are using—say about 20 to 25 permeability, 7 psi green compression strength, and 6 per cent moisture—to obtain a smoother surface, and reduce the amount of cutting down or rough polishing.

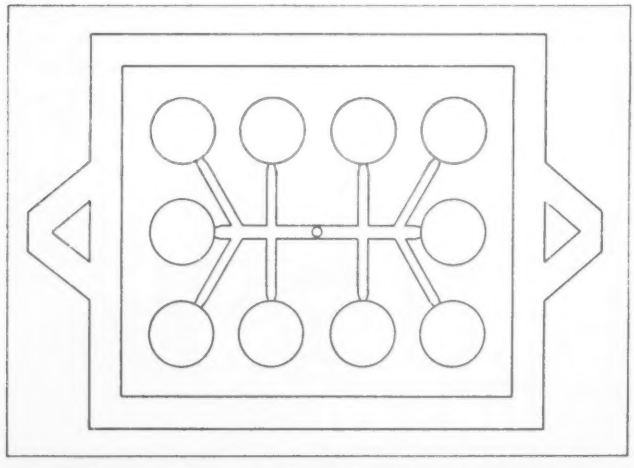
Make Washers in Stack Molds

Q.—We are interested in the manufacture of cast iron washers and will appreciate a detailed account of the most modern and economical method of making them.

A.—For purpose of illustration we may assume that you are going to put one man on the job of making ¾-in. O.G. cast iron washers. You may then regard the following description as applying to a unit and fit up as many more as may be required. A ¾-in. washer is 2¾ or 3 in. in diameter, therefore a 12 x 14 in. snap flask will accommodate ten patterns. For a limited number the pattern may be wood, but for an extended run a metal pattern is preferable. The metal pattern may be a flat plate with the washers on one side, or a flat plate with the individual patterns bolted or riveted on one side.

The first step is to make a wood pattern and cast ten pieces from it, either white metal, aluminum or brass. The castings are finished true and smooth in the lathe, with particular care to see that the central hole in each is true and nicely tapered. A center line is scribed on the plate and the patterns are arranged as shown in the accompanying illustration. Two ¼-in. holes are drilled through each pattern and plate. Each pattern is marked so that it may be returned to place. The holes may be tapped for screws to fasten the patterns to the plate, or the holes may be countersunk for rivets.

The pattern plate may be aluminum or white metal, or it may be a steel plate ¼-in. thick. The most important feature is that it must be flat and straight. A wood pattern for the runner and gates is fitted in place. The main branch is 1¼ in. wide, ¾-in. thick. Each branch is ½-in. thick and ¾-in. wide and ⅛-in. thick where it touches the washer pattern. A casting from the gate pattern is finished and attached to the plate. A ⅞-in. hole is drilled in the center to serve as a guide in setting the sprue.



Pattern arrangement for production of ten pieces

With everything ready, the molder lays the plate on the machine table, pattern side up, and sets on the part of the flask containing the guide pins. If he uses a snap flask he drops an iron or steel band inside the flask to prevent the sand from bursting when the mold is filled with metal. He riddles sand over the patterns and presses the sand in the holes with his finger, then fills the flask with sand and squeezes it. He adjusts a bottom board on this first section, rolls the mold over, raps the pattern plate either by hand or by vibrator and lifts it off. He carries the mold to the floor, removes the snap flask, returns to the machine and repeats the performance.

In the second and all succeeding sections a short gate pin is placed in the center of the mold to leave a hole through each body of sand and form a continuous upright gate opening from top to bottom. Properly speaking, no copes are used. The bottom face of each mold section serves as a cover for the preceding mold. Ten or 12 sections are stacked for each unit.

Making Lead Punches and Dies

Q.—Some time ago we read of some developments made in the method and process of casting lead dies and punches used in the aircraft industry to produce a better surface and reduce to a minimum the amount of time necessary to scrape, grind and polish the die on the cope. We are not certain, but believe we read the article in FOUNDRY.

A.—We believe that the procedure of casting lead dies and punches to produce smooth surfaces is that wherein such metal is poured directly on the mating die, if the latter is a zinc-base alloy called Kirksite. However, we have not published any articles on the procedure, but have seen references to the practice in the literature.

Essentially it consists of building a form of sheet metal or plywood boards lined with asbestos around the zinc-base die. The form is braced suitably to withstand the pressure of the molten lead. Fillets made of fireclay mixed to a stiff paste with three parts lard oil or kerosene, or made of plaster, are applied to all interior corners to prevent the lead from leaking or running out. This must be done carefully since lead not only is heavy, but is extremely fluid when molten and can find its way through minute crevices.

Antimonial lead containing 4 to 7 per cent Sb is used for drop hammer work, but the antimony content may be higher for forming presses. The molten antimonial lead is poured at a temperature of about 800°F, and in such a manner that it is distributed over the die face rather than in one spot. Otherwise the die face may wash or melt.

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MEN
of Industry

RAYMOND H. SCHAEFER has been elected a vice president, American Brake Shoe Co., New York. Mr. Schaefer, a graduate of Carnegie Institute of Technology, joined the company in 1940 as assistant foundry metallurgist of the Manganese Steel Division. He was successively foundry metallurgist and general foundry superintendent. In 1943 he became assistant chief metallurgist of the company and in 1945 was named chief metallurgist. Since 1947 Mr. Schaefer has been director of research and development. He will continue in that capacity at the experimental foundry in Mahwah, N. J.

♦ ♦ ♦

Lloyd A. Mapes has been appointed head of the Casting Section of the Light Metals Division, National Production Authority. Mapes, a graduate of University of Wisconsin, has been associated with the aluminum industry since 1938. Recently he was regional sales promotion manager for the Building Products Division, Reynolds Metals Co., Louisville. During World War II he was property officer for the St. Louis Ordnance Depot, managing and directing property accounts, while on leave from the Aluminum Goods Mfg. Co., Manitowoc, Wis., where he had prepared advertising and sales promotion presentations. Prior to that he was associated with Aluminum Co. of America in advertising and sales promotion activities.

♦ ♦ ♦

Dr. Robert I. Jaffee has been named supervisor of research in nonferrous physical metallurgy, Battelle Memorial Institute, Columbus, O., where he will guide investigations on the properties of the less familiar metals and their alloys. He holds degrees in chemical engineering and metallurgy from Illinois Institute of Technology, Harvard University and University of Maryland and has been associated with Battelle since 1943.

Dr. Ivor E. Campbell, a member of the Battelle staff since 1943, has been appointed supervisor of research on chemical problems in nonferrous metallurgy. Dr. Campbell was graduated from Evansville College and received a Ph.D. degree from Ohio State University.

♦ ♦ ♦

Wiser Brown has been named chief industrial engineer of the operating department, Aluminum Co. of America, with headquarters in Pittsburgh. A graduate of Cornell University, Mr. Brown joined the company in 1922. He left the works managership of the Fairfield, Conn., works in 1940 to join American Magnesium Corp., Cleveland, as general manager. Last year, when Alcoa acquired the company, he was put in charge of magnesium fabricating activities. From 1944 to 1949 he was also product manager for Alcoa sand and permanent mold castings. **Frank Welborn,** since 1946 personnel manager in the company's permanent mold foundry, Cleveland, has become personnel director of the Bridgeport, Conn., works. **Carson Brooks,** staff metallurgist at Cleveland has been transferred to the Aluminum Research Laboratories, New Kensington, Pa., as assistant chief of the process metallurgy division. A graduate of Massachusetts Institute of Technology he joined the metallurgical department of the Massena, N. Y., works in 1936.

♦ ♦ ♦

William J. Phillips, for several years director of the castings development department, Steel Founders' Society of America, has joined Crucible Steel Casting Co., Cleveland, as chief engineer. Mr. Phillips attended Albright College and Pennsylvania State College, working in steel foundries during summer vacations. He was associated with Malleable Iron Fittings Co., Branford, Conn., where he worked in the laboratory and became assistant manager of the steel foundry. Later he joined Symington-Gould Corp., Rochester, N. Y., working in sales and as assistant works

(*Continued on page* 118)

RAYMOND H. SCHAEFER
. . . V. P., American Brake Shoe

LLOYD A. MAPES
. . . light metal castings, NPA

DR. ROBERT I. JAFFEE
. . . Battelle, physical research

DR. IVOR E. CAMPBELL
. . . chemical research, Battelle

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MEN *of Industry*

(*Continued from page* 116)
manager and manager of industrial sales. Subsequently he resigned to assist in organizing Phillips Foundry Co., Bakersfield, Calif., as vice president and later became president, prior to joining Steel Founders' Society.

♦ ♦ ♦

Richard L. Bradley, until recently associated with the corporation service division, LaSalle Extension University, has been appointed to direct the activities of the training and special programs division of Lester B. Knight & Associates Inc., Chicago and New York. Mr. Bradley, who has been active in the fields of business training, sales promotion and marketing, was also associated with Aldens Inc., Chicago.

♦ ♦ ♦

J. W. Stuart has been appointed eastern sales representative, Machine Division, the Osborn Mfg. Co., Cleveland, succeeding the late George G. Adam. Mr. Stuart, a graduate of Tri-State College, has been associated with the foundry industry since 1933. Previous connections include foundry manager, Products Machine & Foundry Co., Bridgeport, Conn., and foundry engineer, Farrel-Birmingham Co., Ansonia, Conn. A resident of Derby, Conn., his territory in the new position will include the New England states, New Jersey, eastern Pennsylvania and eastern New York.

♦ ♦ ♦

John E. Carroll, formerly general sales manager, American Hoist & Derrick Co., St. Paul, has been named vice president-sales. Mr. Carroll was graduated from University of Minnesota. He joined the company in 1937 and worked as a district representative in Texas, Chicago and west coast territories. In 1945 he resigned to become a partner in Harron, Rickard & McCone Co. of Southern California, managing the construction machinery division. He returned to American Hoist as general sales manager in 1949.

♦ ♦ ♦

Russell C. Flood has been appointed assistant secretary, Scovill Mfg. Co., Waterbury, Conn., responsible for the accounting, financial and clerical functions of A. Schrader's Son Division, Brooklyn, N. Y. Mr. Flood joined A. Schrader's Son in 1930 and has specialized in the acounting and financial phase of the business since that time.

♦ ♦ ♦

Andrew A. Kucher has been appointed director of Ford Motor Co.'s scientific laboratory, where he will direct a new departmental activity of scientific inquiry and development. Mr. Kucher first worked as a draftsman and designer for various eastern aircraft manufacturers, and in 1918 was instructor in aerodynamics theory and practice, City College of New York. Later he was associated with Westinghouse Electric & Mfg. Co., Philadelphia, and Frigidaire Division, GMC, Detroit. In 1942 he became director of research, Bendix Aviation Corp. Detroit, and vice president in charge of research in 1944.

♦ ♦ ♦

E. P. Roudebush has been named works manager in charge of production, **D. A. Johann,** sales manager in charge of sales and advertising, and **A. E. Caudle,** assistant sales manager, Roots-Connersville Blower Corp., Connersville, Ind. Mr. Roudebush, a graduate of Ohio State University in 1944 joined the parent company, Dresser Industries, Dallas, Tex., as director of industrial engineering, going to Roots-Connersville last year as assistant vice president in charge of manufacturing. Mr. Johann was graduated from Pennsylvania State College and was engaged in the electrical and mechanical equipment field until 1946, when he became manager of Roots-Connersville's Chicago district office. Mr. Caudle, a graduate of Oregon State College, joined the company in 1946.

♦ ♦ ♦

Paul Reeves, since 1943 advertising manager, has been appointed director of sales, Timken Roller Bearing Co., Canton, O. Mr. Reeves was graduated from Carnegie Institute of Technology and joined Timken in 1929. He served as sales engineer in the Chicago office and later became industrial district manager in San Francisco. In 1940 he returned to the Canton office as sales promotion manager, becoming advertising manager in 1943.

♦ ♦ ♦

Norman K. Russell has been appointed refractories engineer, Norton Co., with headquarters at its Philadelphia warehouse. Mr. Russell succeeds the late Russell L. Peck whose territory he will cover in and around Philadelphia as well as the South and Southwest. He was formerly a refractories sales engineer in the company's plant at Worcester, Mass.

♦ ♦ ♦

Robert C. Becherer has been elected vice president, Link-Belt Co., Chicago. Following graduation from Purdue University Mr. Becherer joined the company in 1923. He will continue as general manager of the company's Indianapolis plant, a position he has held since 1947.

♦ ♦ ♦

Melvin W. Cole has been appointed director of the Iron and Steel Divi-

(*Continued on page* 120)

RICHARD L. BRADLEY
. . . joins Lester B. Knight & Assoc.

J. W. STUART
. . . Osborn Mfg. Co. sales

JOHN E. CARROLL
. . . American Hoist V.P.-sales

RUSSELL C. FLOOD
. . . assist. sec., Scovill Co.

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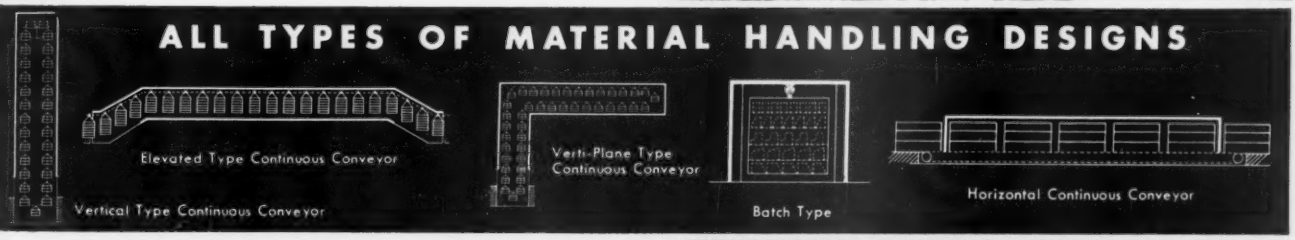

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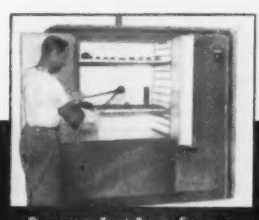
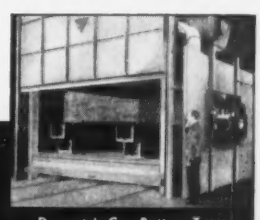


Despatch Tool Room Furnace



Despatch Car Bottom Type

DICKEY DYER
. . . Work-Factor aide, Cleveland

LESTER M. SEARS
. . . Towmotor Corp., chairman

C. EDGAR SMITH
. . . president, Towmotor Corp.

ROBERT L. FAIRBANK
. . . Towmotor, manager of sales

(*Continued from page* 118)
sion, National Production Authority, replacing **David B. Carson,** who has been director since October. Mr. Carson returns to his position as vice president-sales, Sharon Steel Corp., Sharon, Pa. Mr. Cole, on leave from Bethlehem Steel Co., Bethlehem, Pa., where he is assistant general manager of western sales, has been deputy director of the Iron and Steel Division since January. In 1948 he was acting chief of the Steel Division, Office of Industry Co-operation, U. S. Department of Commerce and from 1941 to 1944 was associated with the Steel Division, WPB.

♦ ♦ ♦

Dickey Dyer, formerly associated with Dyer Engineers Inc., Cleveland, has joined the Work-Factor Co., New York, management consultants, as director of new business activities, with headquarters in Cleveland. Mr. Dyer, a graduate of Harvard University, from 1939 to 1941 was associated with Scott Paper Co., Chester, Pa., in personnel and industrial sales activities. Since then he has been associated with Dyer Engineers, industrial management consultants, founded by his father.

♦ ♦ ♦

Lester M. Sears, founder and president, Towmotor Corp., Cleveland, has been named chairman of the board of directors. **C. Edgar Smith,** since 1947 executive vice president, has succeeded Mr. Sears as president. Mr. Sears, who founded the company with his father in 1919, has been president since that time. A graduate of University of Minnesota, he was associated with Peerless Motor Car Corp., Cleveland between 1916 and 1919. Mr. Smith, who was graduated from University of Michigan, joined Towmotor in 1941 as sales manager, and became vice president in 1943. **Robert L. Fairbank** has been named manager of Towmotor sales. Following graduation from Dartmouth College in 1933, he joined Firestone Tire & Rubber Co., Akron, O., where he was salesman, manager of retail stores and since 1945 Cleveland district manager.

♦ ♦ ♦

John Mikulak has been appointed assistant to the vice president-manufacturing, Worthington Pump & Machinery Corp., Harrison, N. J. A graduate of University of Minnesota, he joined Worthington's subsidiary, the Electric Machinery Mfg. Co., Minneapolis, where he served as draftsman and assistant mechanical engineer. In 1944 he became associated with American Car & Foundry Co., New York, where he was successively chief engineer of the welded products division and senior research engineer.

♦ ♦ ♦

Robert J. Stoddard, since 1947 chief engineer, American Hoist & Derrick Co., St. Paul, has been elected vice president in charge of engineering. Mr. Stoddard, a graduate of University of South Carolina and Massachusetts Institute of Technology, joined the company in 1937 as assistant chief engineer. Prior to that he was associated with American Bridge Co., Pittsburgh, and Tennessee Valley Authority.

♦ ♦ ♦

J. J. Nolan Jr., Central Foundry Co., Newark, N. J., has been re-elected president of the Cast Iron Soil Pipe Institute. **J. W. Struve,** Rich Mfg. Co., Los Angeles, was named vice president and **Deems W. Hallman,** Hajoca Corp., Lansdale, Pa., was re-elected treasurer. Directors named at the annual meeting held recently in Palm Springs, Calif., include: **C. A. Hamilton,** Alabama Pipe Co., and **Joseph H. King III,** T. C. King Pipe & Foundry Co., both of Anniston, Ala.; **M. J. Harvey,** Tyler Pipe & Foundry Co., Tyler, Tex.; **H. M. Singmaster,** East Penn Foundry Co., Macungie, Pa.; **Arnold Boscacci,** American Brass & Iron Foundry, Oakland, Calif., and **H. E. Robertson,** Somerville Iron Works, New Castle, Pa.

♦ ♦ ♦

Donald MacBrien, recently in charge of industrial and foundry coke sales, Philadelphia Coke Co., Philadephia, has been given leave to join the Department of the Interior, Washington, as assistant director of the Coke Division, Defense Solid Fuels Administration. A graduate of Northeastern University, Mr. MacBrien joined Eastern Gas & Fuel Associates, Boston, in 1935 as a chemical engineer. He was transferred to Philadelphia in 1942 as assistant chief chemist of Philadelphia Coke Co. and has directed coke sales there since 1947. During his absence his duties will be assumed by **Fred T. Schaefer,** who has been associated with Philadelphia Coke Co. for 17 years.

♦ ♦ ♦

Donald Ross, for the last 8 years secretary - treasurer, United States Pipe & Foundry Co., Burlington, N. J., has resigned to become first vice president, United Concrete Pipe Corp., Baldwin Park, Calif., a subsidiary. **Lorenzo Semple** has been named vice president-treasurer and **John W. Brennan,** secretary, of U. S. Pipe & Foundry Co. **C. S. Lawson,** president, Sloss-Sheffield Steel & Iron Co., and **H. Lloyd Nelson,** president, United Concrete Pipe Corp., have been named board members.

♦ ♦ ♦

Morris L. Hicks has been appointed manager of the Philadelphia district office, Dravo Corp., Pittsburgh. Mr. Hicks joined the company following graduation from Swarthmore College

(*Concluded on page* 123)

Advertisement

ELECTROMET Data Sheet

A Digest of the Production, Properties, and Uses of Steels and Other Metals

Published by Electro Metallurgical Company, a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. • In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

MANGANESE . . .
Deoxidizer and Toughener for Steel

Manganese is one of the most important alloys used in making steel. It is practically indispensable as a deoxidizer and cleanser for improving the hot-working properties of steels. When used as an alloying element, it makes steel stronger and tougher and it is therefore an important constituent of many structural and engineering steels.

Deoxidizes and Cleans Steel

The effectiveness of manganese in deoxidizing steel was first recognized in 1856, when it was used in the Bessemer process of steelmaking to counteract the bad effects of sulphur; in fact, manganese made this process a commercial success. Today, manganese is used as a deoxidizer and cleanser in the production of nearly all grades of open-hearth and electric-furnace steel, as well as high-grade cast iron.

Research work carrried out recently in ELECTROMET'S laboratories at Niagara Falls, New York, has provided new and important information on the value of manganese as a deoxidizer. This work shows that manganese is a more effective deoxidizer than has been previously realized; and that a combination alloy of silicon and manganese is a much stronger deoxidizer than either silicon or manganese by itself. Complete information is given in a report entitled "Solubility of Oxygen in Liquid Iron Containing Silicon and Manganese." If you would like a copy of this report, free of charge, write to the address above.

Improves Hot-Working Properties

By combining readily with sulphur, manganese performs another valuable job, it removes the principal cause of hot-shortness or brittleness—thereby giving steel better rolling and forging properties. In this reaction, the manganese combines with the sulphur to form manganese sulphide, as follows:

$$Mn + FeS = MnS + Fe$$

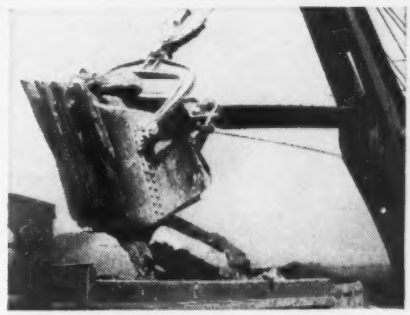
The manganese sulphide remaining in the steel is a less harmful type of inclusion than the iron sulphide would be, the hot-working properties of the steel are improved.

The weakening and embrittling tendencies of sulphur in cast iron can also be counteracted by the addition of manganese to the cupola charge.

Increases Strength, Toughness, and Wear-Resistance

When used as an alloying element in steel, manganese produces a steel with greater strength and toughness, and there is no serious loss of ductility. Additions of about 13 per cent manganese produce the well-known Hadfield manganese steel. High-manganese steels have exceptional resistance to wear; and consequently they have many applications in engineering jobs. Instead of wearing away quickly under conditions combining severe pressure, shock, and abrasion, these steels actually become harder through use. Thus, they last longer.

Because of the tendency of high-manganese steels to work-harden, they serve industry in important and varied applications. Manganese steel castings, for example, are used for railroad frogs and crossings, rock-crusher parts, steam-shovel dipper teeth, and dredge-bucket lips. The chief applications of manganese steel are in rails used for special service, and light forgings subjected to heavy wear.



Dipper bucket teeth, cast of Hadfield manganese steel, actually increase in hardness under abrasive wear from gravel and rock in construction work — thus last many times longer than those of ordinary steel.

ELECTROMET Alloys

Manganese is produced by ELECTROMET in forms suitable for practically every use of the iron, steel, and non-ferrous metal industry. Some of the ELECTROMET products are listed below. For a complete description of these alloys, write for a copy of the 100-page booklet, "ELECTROMET Ferro-Alloys and Metals."

The terms "EM" and "Electromet" are registered trade-marks of Union Carbide and Carbon Corporation.

Alloys of Manganese and Their Uses

Standard Ferromanganese	The product most commonly used for adding manganese to steel for the purpose of alloying or deoxidizing and cleansing.
Low-Carbon Ferromanganese	For adding manganese to steels having a low carbon content, such as stainless steels of the 18 per cent chromium, 8 per cent nickel type.
Medium-Carbon Ferromanganese	Commonly used for making manganese steel containing 1.50 to 2.00 per cent manganese, and in the production of Hadfield manganese steel.
Low-Iron Ferromanganese	For applications in the nickel, aluminum, and copper industries where a low-iron alloy is required.
Silicomanganese	Used by the steel industry as a furnace block; as a deoxidizer; and also for manganese additions, particularly in the production of engineering steels containing 0.10 to 0.50 per cent carbon.
"EM" Silicomanganese Briquets	For adding manganese (with silicon) to cast iron in the cupola.
"EM" Ferromanganese Briquets	For adding manganese (without silicon) to cast iron in the cupola.

BIG CASTINGS

This is the biggest steel casting ever shipped by rail.

OR LITTLE ONES

. . . EITHER WAY, YOU WILL NEED UNITED'S CORE OIL FOR THE BEST RESULTS!

Compare this 165,000 pound steel casting made by the Erie Forge Co. with the malleable castings shown above which are turned out by Eberhard Mfg. Company of Cleveland, some of which weigh less than 1/3 of an ounce. Both were made with United's Core Binders and both are tops in their respective fields.

If your castings "weigh in" at some point in between these limits then United has the right oil to recommend for your work. Write for our latest bulletin on Core Binders.

UNITED OIL MFG. CO.

1429 WALNUT STREET . . ERIE, PA.

The large steel runner shown above cleared the rails by six inches when loaded. It was slung between two cars and a thin section was trimmed from the big ring to clear bridges. It moved on a special train with speed limited to 15 miles per hour and travel held to daylight hours only.

(*Concluded from page* 120)

in 1932. He was a member of the Philadelphia sales organization for 13 years, when he was transferred to Pittsburgh as sales manager of the engineering works division.

♦ ♦ ♦

Lawrence C. Mertz, vice president, Unitcast Corp., Toledo; **Ralph N. Cole,** president, Canton Malleable Iron Co., Canton, O., and **Ralph L. Lee,** secretary - treasurer, Grede Foundries Inc., Milwaukee, are serving the Office of Price Stabilization, Washington, as consultants with its Metals Division on problems affecting steel, malleable iron and gray iron castings, respectively.

L. C. MERTZ

R. N. COLE

Mr. Mertz joined the Industrial Steel Castings Co., Toledo, in 1919. In 1937 this company's name was changed to Unitcast Corp., of which Mr. Mertz currently is vice president in charge of sales. Mr. Cole became secretary of the Canton Malleable Iron Co. in 1921 and has been president since 1926. He is a past president of the Malleable Founders' Society, served on the malleable iron industry advisory committee to the OPA during World War II and was a member of the committee representing the industry during NRA days. He has been particularly active as chairman of the Cost Committee of the Malleable Founders' Society. Mr. Lee has been in the foundry industry since 1917. He was made secretary-treasurer of the Liberty Foundry Co., Milwaukee, in 1920, holding that position for 20 years. In 1940 the company merged with Grede Foundries Inc., and he was comptroller prior to becoming secretary-treasurer.

R. L. LEE

♦ ♦ ♦

A. L. Hunt, works manager, National Bearings Division, American Brake Shoe Co., St. Louis, has been appointed chairman of the Foundry Educational Foundation's advisory committee for the Missouri School of Mines, Rolla, Mo. He succeeds **C. R. Culling,** president, Carondelet Foundry Co., St. Louis. **Webb Kammerer,** Midvale Mining & Mfg. Co., has been named vice chairman and **Ralph Hill,** East St. Louis Castings Co., has been elected secretary of the committee.

♦ ♦ ♦

Malcom W. Valentine, superintendent of quality control and inspection, and **Joseph A. McNulty,** coremaker, Hunt-Spiller Mfg. Corp., Boston, recently completed 35 years of service with the foundry.

♦ ♦ ♦

Eric O. Melmer has been appointed secretary and chief engineer, Jervis B. Webb Co. of California, Los Angeles, subsidiary of the conveyor manufacturers, Jervis B. Webb Co. of Detroit. Mr. Melmer has been associated with the conveyor industry for over 20 years as designer, chief draftsman and chief engineer.

♦ ♦ ♦

Frederick W. Thomas has been appointed director of purchases, Joy Mfg. Co., Pittsburgh, succeeding **George R. Fox** who has been named assistant vice president in charge of the company's plant expansion program. Mr. Thomas until recently was general manager of purchases, Worthington Pump & Machinery Corp., Harrison, N. J.

♦ ♦ ♦

R. F. Merwin has been named president-general manager, Eriez Mfg. Co., Erie, Pa., succeeding **O. F. Merwin,** company founder, who has become board chairman. R. F. Merwin was graduated from Hiram College and was engaged in newspaper and other editorial work until he joined Parker White Metal & Machine Co., Erie, Pa. Since his association with Eriez he has been sales manager, vice president and later general manager.

♦ ♦ ♦

Harry G. Andersen has been appointed Birmingham district manager, Link-Belt Co., Chicago, succeeding **J. T. Bell Jr.,** who has rejoined the Army. Mr. Andersen, who attended Northwestern University, Illinois Institute of Technology and Wisconsin University, joined the company in 1937 at the Chicago plant where he served in the engineering department and district sales until 1948, when he was transferred to Milwaukee.

♦ ♦ ♦

F. R. Morral, until recently associate professor of materials engineering, Syracuse University, has joined the metallurgical research staff, Kaiser Aluminum & Chemical Corp., Spokane, Wash., as head of the x-ray diffraction department. Dr. Morral, a native of Germany, received his Ph.D. in metallurgy at Purdue University, later studying at the Metallographic Institute, Stockholm, Sweden. Previous connections include American Cyanamid Co., New York, and Continental Steel Corp., Kokomo, Ind.

R. F. MERWIN
. . . president, Eriez Mfg. Co.

HARRY G. ANDERSEN
. . . Link-Belt mgr., Birmingham

F. R. MORRAL
. . . research, Kaiser Aluminum

Steel Founders' Society

Discusses Defense Requirements

By FRANK G. STEINEBACH
Editor
FOUNDRY

DISCUSSION of defense requirements for steel castings—especially cast parts for the tank program—was the feature that attracted a record attendance at the 1951 annual meeting of the Steel Founders' Society of America. Registration for the three-day meeting, held at the Edgewater Beach Hotel, Chicago, Mar. 19-21, totaled 350. In addition, one or more representatives from each of the Army Ordnance districts were present to emphasize the immediate need for a greater tonnage of steel castings for defense work.

With Thomas H. Shartle, president of the society, and president, Texas Electric Steel Castings Co., Houston, Tex., presiding, the Monday afternoon session was devoted entirely to consideration of defense requirements. Brig. Gen. David J. Crawford, Ordnance Tank-Automotive Center, Detroit Arsenal, Center Line, Mich., emphasized the joint responsibility of industry and government in providing the materials for defense. The present defense effort may require the rebirth of war industry much bigger than now realized. General Crawford believes that instead of a mushroom growth, the program may develop into a healthy part of the national economy.

If the steel foundry industry can produce sufficient tank castings to permit the program to keep pace with growth of the military forces, it will help the country over a rough spot. Tank production in the next year will cost about $4 billion, and approximately two-thirds of that should be completed by the end of the year. Similar production programs probably will follow in 1952 and 1953. There is a need for sources of supply to meet requirements, especially for castings weighing up to 300 pounds. General Crawford stated that castings are used in heavy tonnages in the medium and heavy tanks because more can be done with a pound of metal in the shape of a casting than with a plate of similar weight.

Burr H. Allen of the Arsenal presented charts to show the cumulative requirements vs. the cumulative capacity with a 60-day lead time. Since Ordnance needs at least three sources of supply for each type of casting, Mr. Allen emphasized the urgency for all steel castings producers to study the possibility of participating in the program. Mr. Allen believes that tank construction will continue for some years.

Prescott Goud of the Arsenal endeavored to remove some of the mysteries which seem to enshroud the manufacture of cast armor. The metal is simply a medium-alloy steel which is heat treated to conserve alloys as much as possible. Heat treatment is nothing unusual, consisting of a homogenizing treatment of 1700 to 2000° F, and quenching at a normal temperature, drawing at 1200° F, and quenching after the draw to eliminate temper embrittlement. Charpy V-notch impact tests are required to determine if the material has been properly heat treated. The analysis in general is not unusual, and in many cases has been developed by individual foundries. The material must be weldable, and must withstand ballistic and impact tests. Soundness is required, and x-ray or gamma-ray must be available to develop production procedures. While impact tests are a part of the new specifications, the fracture test used during World War II still is permitted. Extensive welding procedures for repair of armor castings have been established, although the qualifications are not elaborate.

Howard Sprengel of the Arsenal outlined the general inspection policy of the department and discussed the assistance being offered to producers of components. He stated that testing and ballistic requirements constantly are being reduced through development of quality control programs. He indicated that the department has practical, down-to-earth inspectors who want to help suppliers. Repair of castings by welding is permitted if the repaired casting can meet ballistic requirements.

Lt. Col. James A. Harron summed up the discussion by pointing out the tremendous needs, and asking the steel foundry industry to study the

(*Continued on page* 126)

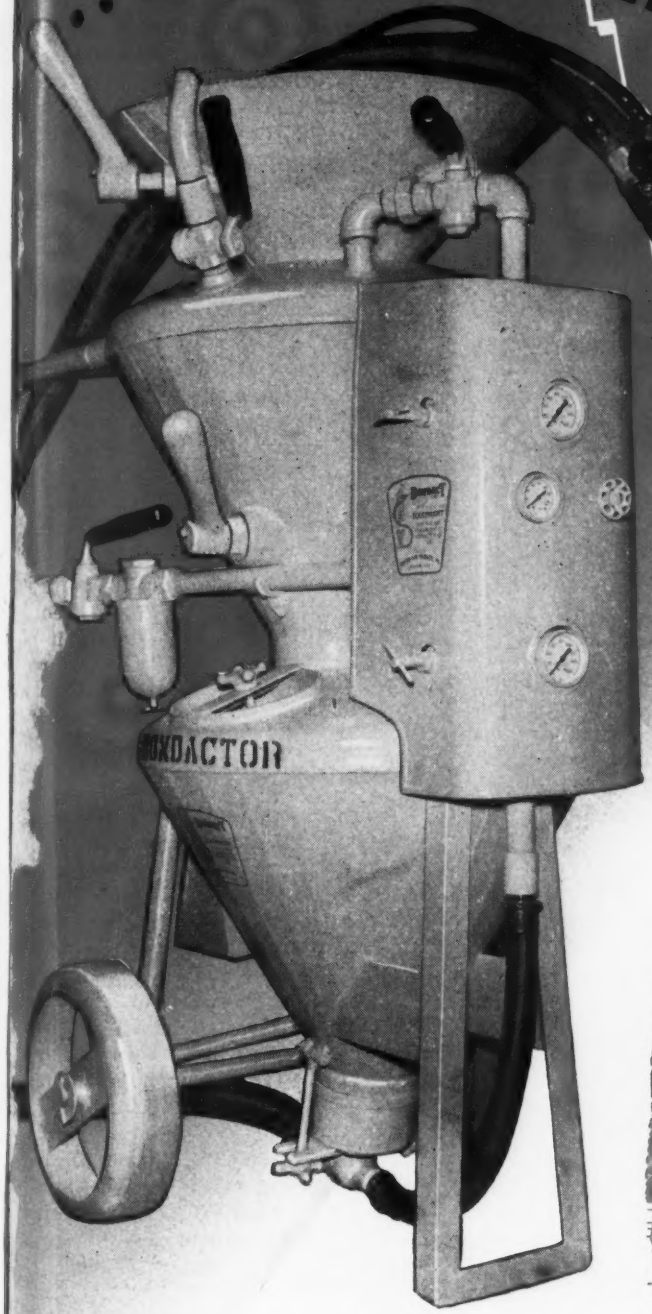
THOMAS H. SHARTLE
Lorenz Memorial Gold Medalist

G. RHOADS CASEY
Elected Society Vice President

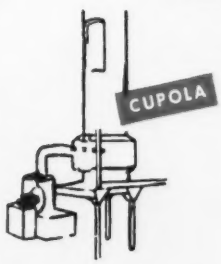
G. A. LILLIEQVIST
Wins Steel Foundry Facts Award

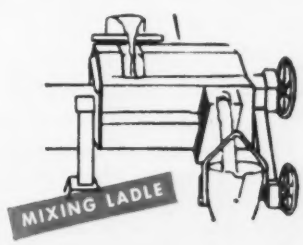
PAUL H. STUFF
T. and O. Gold Medalist

...the new BONDACTOR machine 1951



No, sir, we're never satisfied! If Bondactor can be improved, we'll do it. In fact, we've done it. . . The new 1951 Model holds more material (larger hopper). It feeds even more smoothly, permitting a finer control over moisture content. This effects a still greater uniformity in the lining and a more refractory and durable repair than ever before. The Bondact machine is now huskier in construction, registering a new low in maintenance. A newly designed control panel still further simplifies operation.





EASTERN CLAY PRODUCTS, INC.

JACKSON, OHIO

DIXIE BOND • BLACK HILLS BENTONITE
REVIVO BOND • REVIVO SUPER BOND
BALANCED REVIVO

E C P

BONDING CLAYS and EXCEPTIONAL FOUNDRY SERVICE

Since 1926

BONDACTOR EQUIPMENT • CUPOLINE REFRACTORY • DURA PRODUCTS

(*Continued from page* 124)
blueprints and castings on display at the meeting to determine how each plant might participate in the program. He emphasized that the Ordnance Department is not too hard to do business with and that the organization is doing everything possible to eliminate red tape.

A. J. McDonald, chief, Iron and Steel Castings Section, NPA, stated that cast products are commanding a position of greater respect than ever before in the production of tanks and other military products. The greatest need at the moment is for light castings, and foundries should pitch in and help solve the problem of procurement. The introduction of melt sheets in the near future, will permit determination of essential end uses and necessary alloy requirements. The Controlled Materials Plan probably will be placed in operation about July 1.

Discusses Alloy Conservation

In opening the annual meeting, President Shartle stressed the importance of conserving alloys. He said the society had sent the membership copies of a number of discussions on alloy conservation and substitutions, and urged all present to study this information in the interest of keeping all steel foundries operating.

Kermit Donaldson, executive vice president of the society, gave an interesting report which dealt chiefly with the Washington picture and its influence on the steel castings industry. Mr. Donaldson referred to the assistance given the National Security Resources Board in writing a control order which followed the controlled materials plan of World War II. Mr. Donaldson also reported on the work of the Steel Foundry Industry Advisory Committee to the Munitions Board and stated the data collected in the survey of the steel castings industry have been tabulated and should be available shortly. Contact is maintained with numerous NPA departments, including the castings and alloy sections.

He reported that those in the scrap section of NPA realize price ceilings have resulted in dislocation of supply. While scrap is being allocated to the mills, no allocation of foundry grades is being undertaken, except some railroad scrap. It is felt that the foundry scrap situation will become more serious and will affect defense work to some extent. A temporary increase in scrap supply is expected during the summer, but the industry will go into the fall and winter months facing a much more serious scrap situation. Use of the Controlled Materials Plan may demonstrate the necessity of allocating scrap. Washington realizes that it is not possible to have just a little allocation. Complete allocation of the scrap supply is necessary. It is apparent that the price order has resulted in a lack of segregation of foundry grades. The suggestion was made that individual foundries present problems in scrap procurement to the scrap section of NPA.

Charles W. Briggs, technical and research director, confined his report to several technical matters of particular interest to those doing defense work. He discussed several government specifications, including a new one soon to be applicable, which deals with "construction of steel parts for ordnance materiel." This covers both cast and wrought material in the same specification. The specification provides for five classifications covered by yield strengths ranging from 30,000 to 185,000 psi, and reduction in area. Class A also provides for impact requirements at —20° F. No reference is made to tensile strength.

The new specification will require that drawings give a class number and show the critical section. Test coupons will correspond to the thickness of the critical section. With this specification the individual parts will not be inspected by government, but the assembly produced by the prime contractor will be inspected. Mr. Briggs indicated that with this new specification, it may be possible for government to secure cast or wrought parts at a much faster rate.

Mr. Briggs stated the following research projects are nearing completion: 1—Metal removal in cleaning steel castings; 2—Determination of the distance risers will feed in uniform sections. Two other projects are in process, one dealing with fa-

(*Concluded on page* 129)

FEF SCHOOL TO EXPAND FOUNDRY

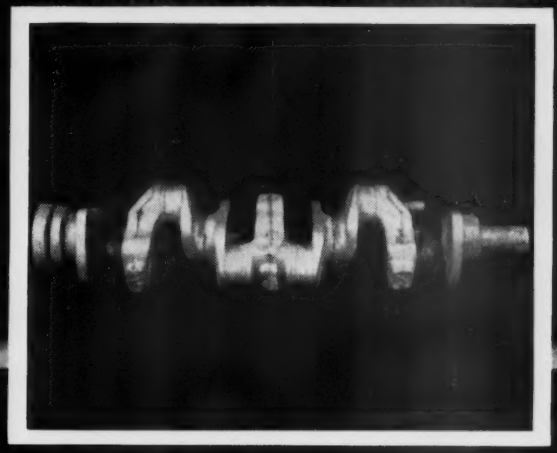
PLANS for expanding the Missouri School of Mines foundry laboratory facilities were discussed at a joint meeting of the Foundry Educational Foundation industrial advisory committee and school metallurgy officials Mar. 2-3. Provision for increased nonferrous melting capacity is included in the expansion program. Eventually as much as $50,000 worth of equipment may be made available for the foundry program.

In addition to plans for expansion of the foundry, the group discussed plant safety and fundamentals of foundry material handling.

Shown at the meeting, left to right, bottom row: George Mellow, Liberty Foundry Co., St. Louis; A. L. Hunt, National Bearing Division, American Brake Shoe Co., St. Louis; C. R. Culling, Carondelet Foundry Co., St. Louis; Claude B. Schneible, FEF president; Dean Curtis L. Wilson, Missouri School of Mines; George K. Dreher, FEF executive director, and Prof. D. S. Eppelsheimer, Missouri School of Mines FEF faculty adviser.

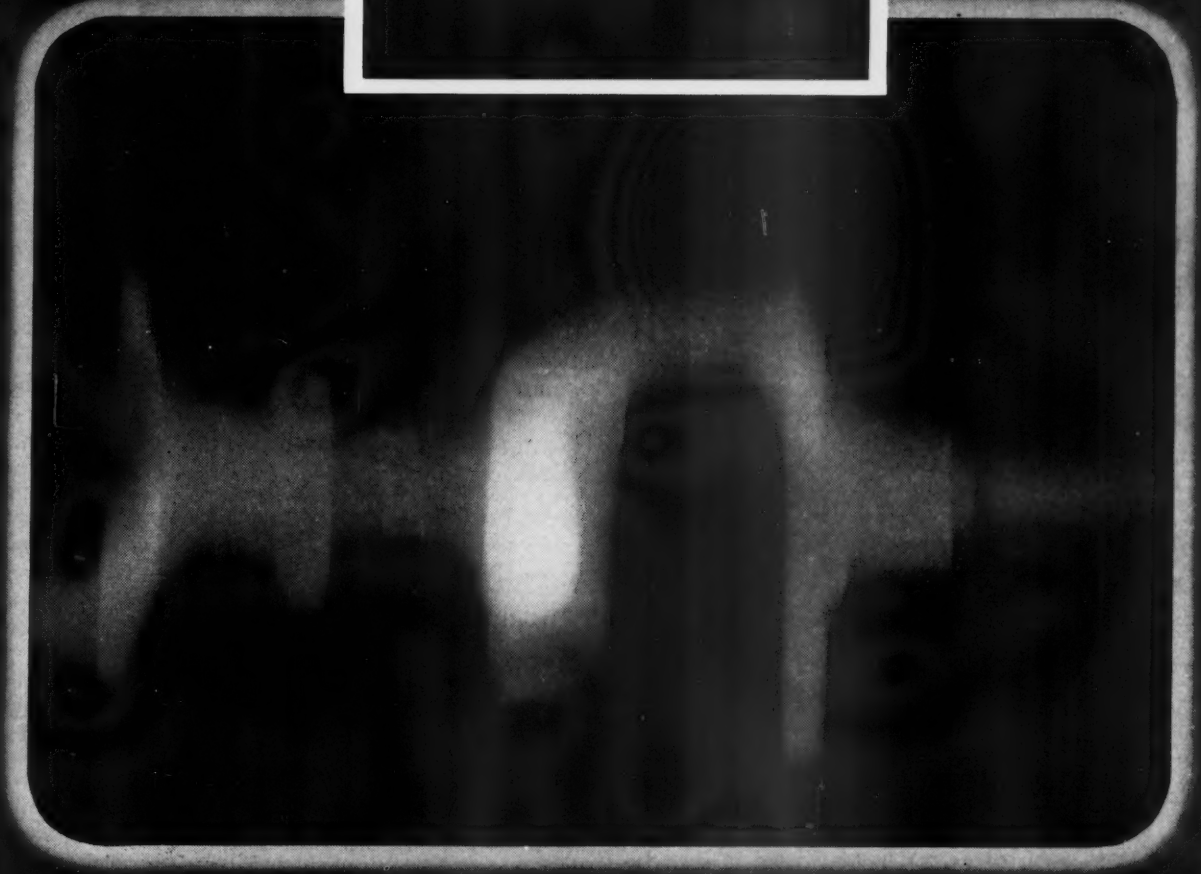
Second row: A. W. Schlechten, Missouri School of Mines; Webb L. Kammerer, Midvale Mining & Mfg. Co., St. Louis; J. A. Williamson, M. A. Bell Co., Granite City, Ill.; Ralph Hill, East St. Louis Casting Co., East St. Louis, Ill.; L. R. Kleber, General Steel Castings Corp., Granite City, Ill., and A. Le Claire and Dean R. Z. Williams, Missouri School of Mines. Third and fourth rows are student winners of FEF scholarships and fellowships. Third row: Albin B. Charneski, Robert E. Schuchardt, Gillum E. Burgess, Joe L. March, James Salamas and Edward W. Cawthorne. Fourth row: Jack M. Wheeler, George W. Sullivan, William J. Ruprecht, Norbert F. Neumann and Wade C. Wortz.

Photograph of automotive crankshaft shown in radiograph below.



WILL IT STAND THE GAFF?

IS IT WORTH MACHINING TIME?



Radiography provides the answers

THERE'S a lot more at stake in a crankshaft than mere pounds of steel. Should it let go, the reputation of the foundry can go with it. Costly machining time can be wasted . . . and great inconvenience caused by a breakdown in service.

Best assurance against failure comes through radiography. With it you can check internal conditions with no damage to the part—make sure that no serious hidden flaw exists.

Radiography has become a regular part of many foundries' routine. It forestalls releasing imperfect castings—helps build reputations for consistently good work. It frequently shows how casting operations can be improved to provide higher yields in production runs.

If you'd like to know what radiography can do for you, discuss it with your x-ray dealer. Also send for a free copy of "Radiography as a Foundry Tool."

EASTMAN KODAK COMPANY
X-ray Division, Rochester 4, N. Y.

Radiography...

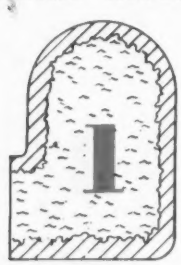
another important function of photography

Kodak
TRADE-MARK

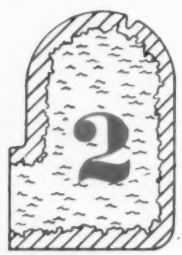
Leading Steel Foundries Use *The Williams Method*

for correct functioning of blind heads

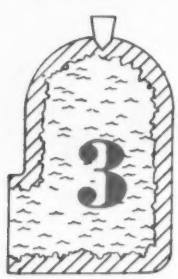
BLIND RISERS IN OPERATION



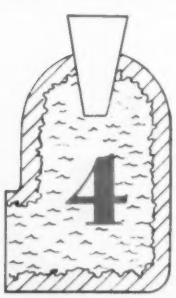
1. The molten metal in a blind riser begins to cool from the outside, forming an airtight skin which becomes thicker as cooling progresses. This tends to exclude atmospheric pressure and thereby shuts off the action of this force on the molten metal in the riser.



2. If the skin is punctured by a sharp tool, prior to any shrink demand, progressive cooling seals up the surface rupture, and the riser is unable to function properly.



3. A device, such as illustrated here, may delay the initial skin formation for a moment, but is no longer effective after the skin begins to form below the device.



4. The patented Williams Method insures the flow of metal until the casting is completely filled. And only this method makes full use of helpful atmospheric pressure throughout the progress of solidification. The insert is usually cone-shaped, but may take other forms or positions without departure from the invention.

LEADING American steel foundries use the patented Williams Method under license agreement to produce sound steel castings. This method makes available the basic advantages of blind risers to the production of steel castings with assurance of proper feeding. It has been in successful use for over 10 years.

The method substantially employs the insertion of a gas-permeable rod-like element of substantially inert refractory material into the blind head to insure free flow of molten metal, and to utilize fully atmospheric and other pressures for perfect casting solidification.

Under the patented Williams Method, such advantages as well-fed molds, successful castings in intricate shapes, more salable product per melt, lower cleaning costs, less distortion—mean money in the bank to you!

We are the sole agents for this patented method which assists in meeting rigid radiographic standards. We will be happy to supply additional information. Write.

A REPRESENTATIVE LIST OF COMPANIES USING THE WILLIAMS METHOD

American Brake Shoe Company	Michigan Steel Casting Company
American Chain & Cable Company, Inc.	Oklahoma Steel Castings Company, Inc.
American Steel Foundries	Pacific Car and Foundry Company
Burnside Steel Foundry Company	Sivyer Steel Casting Company
Canadian Car & Foundry Company, Ltd.	The Symington-Gould Corporation
Electric Steel Foundry Co.	United States Naval Shipyards
General Electric Company	U. S. Steel Corporation
Lebanon Steel Foundry	West Michigan Steel Foundry Co.

DODGE STEEL COMPANY

6501 TACONY STREET • PHILADELPHIA 35, PA.

*UNITED STATES PATENT 2,205,327

"THE MOST EFFECTIVE ALLOY IN A STEEL CASTING IS QUALITY"

(*Concluded from page* 126)

tigue, and the second with machinability of cast steels. Both studies include a comparison with wrought products. Fundamental studies on flowability of molding materials is under way at MIT. Additional projects probably will be started during the year. Mr. Briggs also spoke of the excellent work of the T & O groups, and the publication of the handbook.

William J. Phillips, director of product development, stated that this work of the society in the immediate future will deal with conservation. Efforts will be made to reduce weight and continue the function of the part; to find ways of using straight carbon steel in place of alloys. Mr. Phillips asked members of the society not to give up the type of thinking that the Product Development Committee has stressed. Such thinking and effort will pay off in benefits to the individual company, to the industry, and most of all to the country.

Washington Developments

Chauncey Belknap, counsel for the society, presented an interesting discussion of the most recent Washington developments resulting from the Defense Act of 1950.

At the industry luncheon Thomas S. Shartle was awarded the Lorenz Memorial Medal for 1950 in recognition of distinguished service to the nation's steel casting industry.

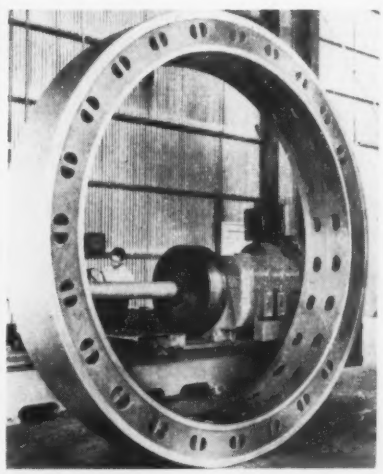
Award of the Technical and Operating medal for 1950 was made to Paul H. Stuff, chief metallurgist, Ross-Meehan Foundries, Chattanooga, for outstanding leadership in affairs of the society and the industry.

G. A. Lillieqvist, research director and chief metallurgist, American Steel Foundries, Chicago, received the annual *Steel Foundry Facts* award for excellence of material published in that publication.

Mr. Shartle's re-election as president of the society also was announced at the luncheon. G. Rhoads Casey, president and general manager, Treadwell Engineering Co., Easton, Pa., was elected vice president, and H. A. Forsberg, vice president, Continental Foundry & Machine Co., East Chicago, Ind., was named a director and executive committee member to serve with Messrs. Shartle and Casey.

Others elected to the 1951 board of directors, together with the executive committee members, are: James S. Thompson Jr., assistant to the president, Symington-Gould Corp., Depew, N. Y.; John B. Fleeger, vice president and general manager, Oklahoma Steel Castings Co., Tulsa; C. L. Snowdon Jr., president, Reliance Steel Casting Co., Pittsburgh; Carl F. Barchfeld, sales manager, Commercial Steel Casting Co., Marion, O.; R. C. Harvey, sales manager, Key Co., East St. Louis, Ill.; and J. Douglas Genger, vice president, Pacific Steel Casting Co., Berkeley, Calif.

The Tuesday morning session was devoted to a discussion of "Price Regulation for the Steel Casting Industry." L. C. Mertz, Unitcast Corp., Toledo, and consultant to the OPS for steel castings, outlined work of the Steel Casting Industry Advisory Committee and the task force. Sam Ewing, chief, Metals Branch, OPS, described the purposes of price stabilization as provided by the Defense Act of 1950. He stated that 14 regional and 63 district offices have been established and that eventually there probably will be 101 districts. However, he believes that most information for the steel casting industry will come out of Washington.



STEEL TIRE: This giant, one-piece cast steel tire for a cement kiln at California Portland Cement Co. was cast and machined at National Supply Co., Torrance, Calif. It weighs 26,000 lb, is 13 ft in diam

Tuesday afternoon, Willard Wirtz, acting executive director of the Wage Stabilization Board, Washington, presented an interesting talk on what has taken place in wage stabilization since September. After an unfortunate delay, it was necessary to rush both wage and price controls, and this made the problem more difficult. Mr. Wirtz discussed the provisions of regulation No. 5, covering plant wage and hour adjustments. Since this regulation contains a number of bugs, a committee is redrafting it. Mr. Wirtz stated there will have to be a case by case consideration of wage stabilization, rather than a single formula. At present there seem to be two outstanding questions: 1—Organization and jurisdiction of the board; and 2—Policy the board will follow.

Leo R. Wertz, deputy director, Office of Defense, Manpower Department of Labor, Washington, in discussing "Manpower Mobilization," emphasized the importance of castings in defense production.

Wednesday morning, Col. Lewis F. Kosch, chief, Manpower Division, Selective Service System, Washington, discussed "Selective Service and Deferment Policies." Colonel Kosch stressed the fact that wars are fought by the entire population, and that Selective Service has the job of finding where each individual can do the most good for his country. With the present age limits of 19 to 26, industry and the armed services are in conflict for only one-thirtieth of the population.

Colonel Kosch said industry is not giving local draft boards sufficient information on individuals for whom deferment is asked. Such an individual must be a regular employee, must be considered irreplaceable, and his removal would result in material loss in productivity. Deferments are made for a period of one year or less, since changes in status occur.

Industry should not wait until an individual is called for a physical examination to supply information and ask for deferment. Such information should be supplied local draft boards when the individual gets his questionnaire, or when he is classified.

Colonel Kosch stated that it is not possible to defer entire groups of workers. However, where shortages of special groups of skilled workers exist, information can be supplied to Selective Service headquarters on the situation. This information then will be sent to the local draft boards so that they may be familiar with the situation. This information must be kept up to date.

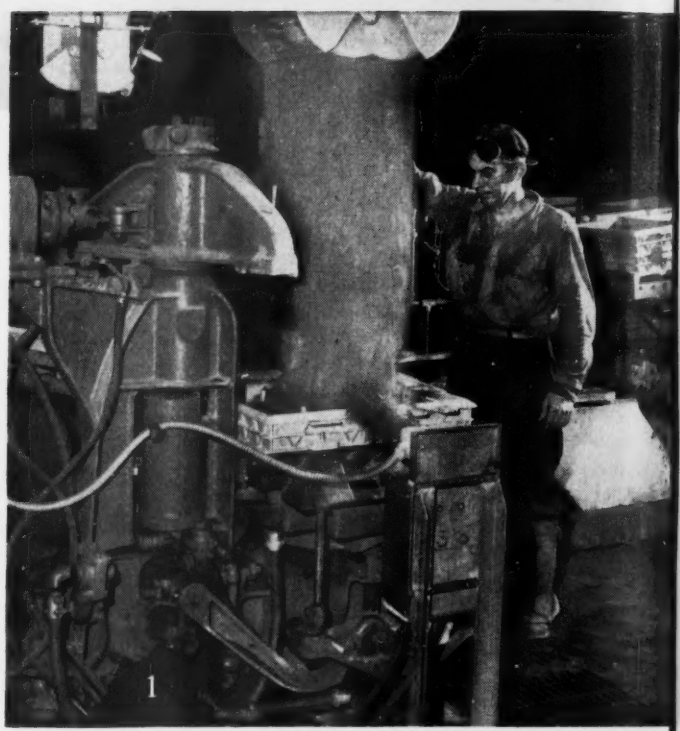
Announcement was made during the meeting that the following foundries had outstanding safety records in 1950:

Plants whose frequency rate was 0: Bethlehem Steel Co., Bethlehem, Pa.; Hartford Electric Steel Corp., Hartford, Conn.; Malcolm Foundry Co., Newark, N. J.; Quincy Steel Casting Co., North Quincy, Mass.; Weatherly Steel Castings Co., Weatherly, Pa.; Tonawanda Elecrric Steel Co., North Tonawanda, N. Y.; and Hughes Tool Co., Houston, Tex., a winner in this classification for three years.

Plants whose frequency rate was under 10: Bethlehem Steel Co., Steelton, Pa.; Chapman Valve Mfg. Co., Indian Orchard, Mass.; General Steel Castings Corp., Eddystone, Pa.; Standard Steel Works Division, Philadelphia; Worthington Pump & Machinery Corp., Harrison, N. J.; Symington-Gould Corp., Depew, N. Y.; Allegheny-Ludlum Steel Corp., Pittsburgh; Continental Foundry & Machine Co., Coraopolis, Pa.; Carnegie-Illinois Steel Corp., Johnstown, Pa.; Mackintosh-Hemphill Co., Midland, Pa.; Walworth Co., Greensburg, Pa.; Crucible Steel Casting Co., Cleveland; Massillon Steel Casting Co., Massillon, O.; Burnside Steel Foundry Co., Chicago; American Steel Foundries, Granite City, Ill.; General Steel Castings Corp., Granite City; and Key Co., East St. Louis, Ill.

NEW OSBORN MOULDING MACHINES H

80% AT WESTINGHOUSE E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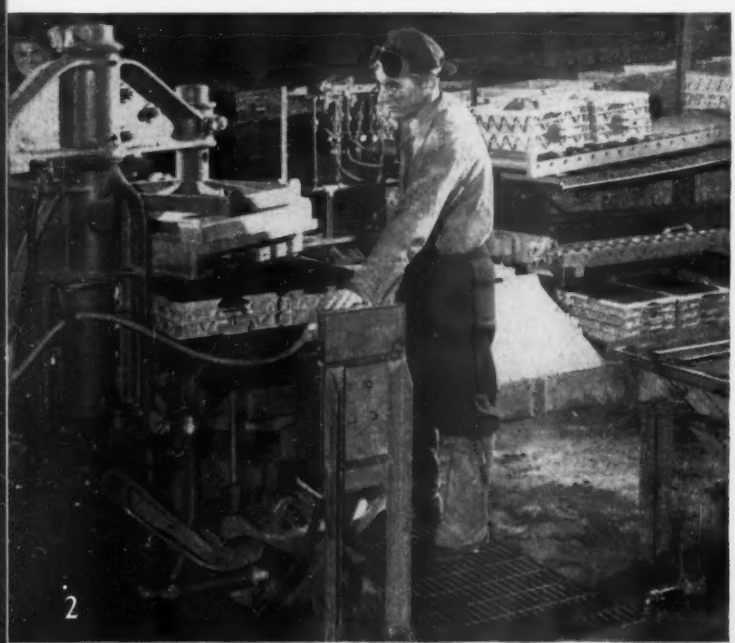
● The recently mechanized foundry of Westinghouse Electric Corporation at East Springfield, Mass. has increased operating efficiency more than 80% and substantially reduced physical fatigue, state company officials.

And new Osborn Automatic Moulding Machines are a contributing factor in reducing the cost of small castings through more efficient production.

Shown here, in photos 1, 2 and 3, is the sequenced operation of one of several #716 PV Osborn Automatic Vibrating Jolt-Squeeze-Stripper Moulding Machines.

Both cope and drag are moulded simultaneously. The machine jolts, squeezes, vibrates and strips patterns automatically.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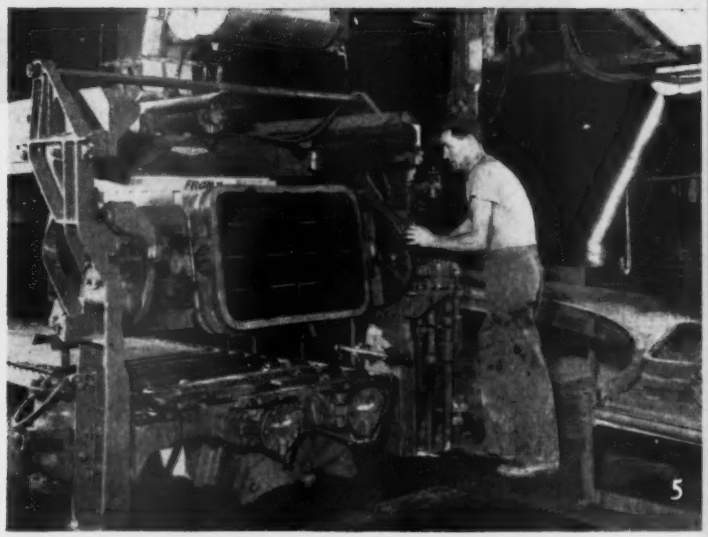
THE OSBORN MANUFACTURING COMPANY
5401 Hamilton Avenue Cleveland, Ohio

ES HELP TO INCREASE EFFICIENCY
SE ELECTRIC CORP. FOUNDRY

4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7

● Photos 4, 5 and 6, shown above, feature one of several large Osborn Jolt-Squeeze-Rollover Machines in use at the Westinghouse foundry. After drag is filled with sand from overhead hopper with air-operated gate, the machine, equipped with air clamps and power rollover, jolts, squeezes, rolls over, vibrates and draws the drag mould. Finished moulds are removed by means of a built-in conveyor. Typical examples of gray iron castings required for fan bases, housings for motors, compressor parts, etc., moulded with Osborn Automatic Moulding Machines are shown in photo 7.

ANOTHER EXAMPLE OF
OSBORN LEADERSHIP
AND ADVANCED ENGINEERING

OSBORN®

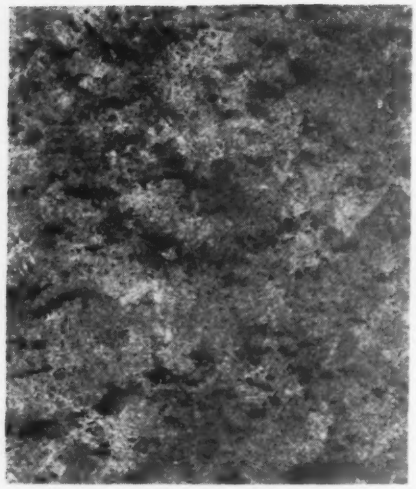
MOULDING MACHINES CORE BLOWING MACHINES

MANUFACTURER'S ASSOCIATION INC. FOUNDRY EQUIPMENT

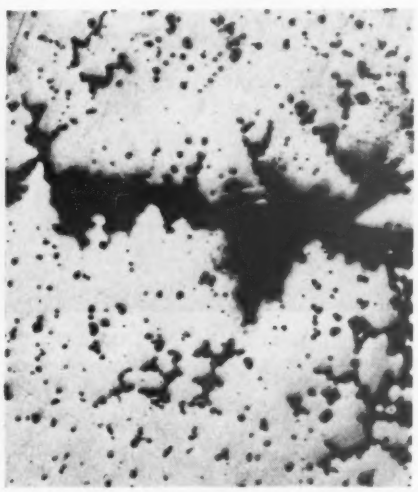
By BRUCE W. SCHAFER
Detroit Electric Furnace Division
Kuhlman Electric Co.
Bay City, Mich.

Melting Tin Bronze

In INDIRECT ARC Electric Furnaces



Showing microporosity in gun metal. This can be caused by poor melting technique. (X3)



Interdendritic shrinkage and gas porosity. (X50, unetched)

LEADED tin bronzes in the liquid state can and do dissolve certain gases, the amount being proportional to the temperature. As these gases are not generated by the metal itself, they can only be added from an outside source—primarily foreign matter in or with the metal, from the heat source, or from the furnace refractory.

In any exchange of heat, there are always certain side reactions which must be considered as a source of contamination. As the temperature of the source is increased, these side reactions are intensified and more difficult to evaluate. In a carbon-arc furnace, we approach maximum temperatures at the heat source. This does not mean that the side reactions which do occur and about which there is little direct knowledge, are necessarily harmful.

The most common reaction which can detrimentally affect the melting of leaded tin bronzes is the dissociation of water vapor to give a source of hydrogen which is rapidly dissolved in the molten metal. The effect of hydrogen, water vapor and carbon monoxide upon the quality of tin bronzes has been widely discussed in the past and it is generally agreed that hydrogen is the worst offender, whether it comes from water on the charge, in the atmosphere, in the refractory or in the fuel. As there is no hydrogen or other elements generated in an arc, this possible source of hydrogen can be eliminated by electric melting.

The presence of finely divided carbon in the melt atmosphere can likewise lead to the formation of carbon monoxide within the molten metal as the carbon can combine with the dissolved oxygen to form insoluble carbon monoxide which is trapped upon solidification to give porous castings.

In operating indirect arc furnaces for melting leaded tin bronzes, we must look for sources of hydrogen as a foreign addition, and the generation of finely divided carbon in the melt atmosphere when gassed castings are encountered.

Possible sources of hydrogen are oil and water in the melting chamber

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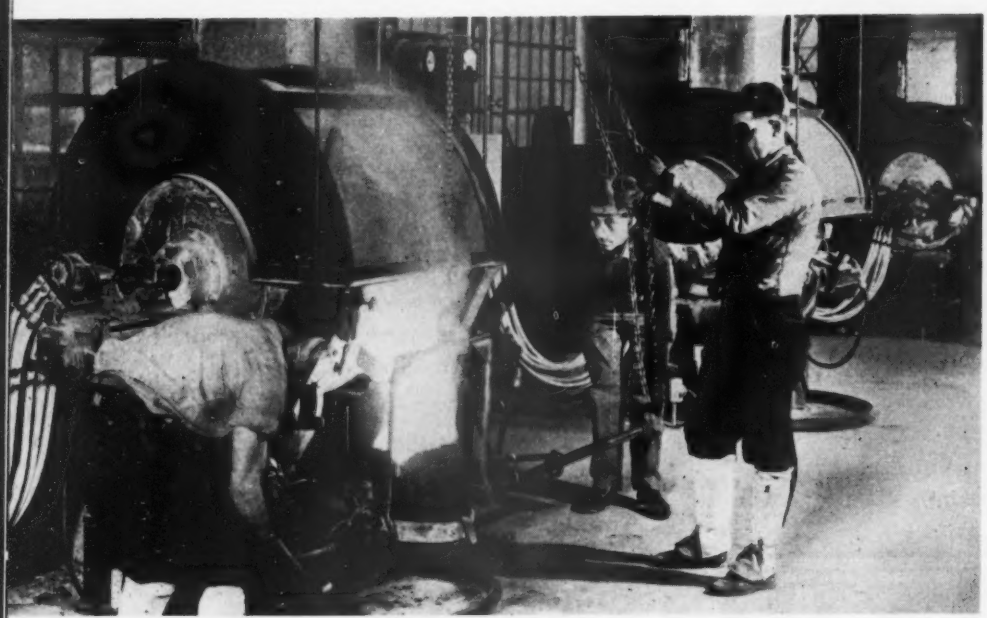
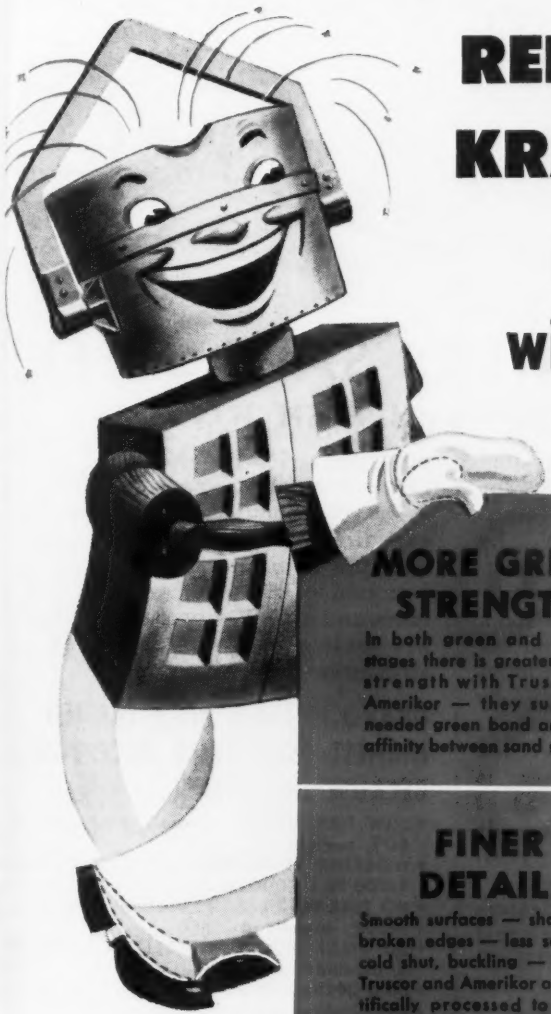


Tapping bronze melting furnace at H. B. Salter Mfg. Co., Marysville, O.

Inverse segregation in this tin bronze casting was caused by a gassed condition

Charley the Core-Maker Says:



REDUCE REJECTS with KRAUSE CEREAL BINDERS

Get more accurate cores with greater green strength

MORE GREEN STRENGTH:

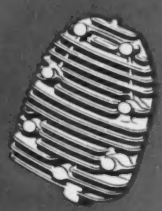
In both green and dry core stages there is greater binding strength with Truscor and Amerikor — they supply the needed green bond and strong affinity between sand granules.

FINE FLOWABILITY AND TEXTURE:

The uniform quality of Truscor and Amerikor insures quicker mix — easier blending — less sticking — uniform ramming — increased permeability.

FINER DETAIL:

Smooth surfaces — sharp, unbroken edges — less scabbing, cold shut, buckling — because Truscor and Amerikor are scientifically processed to provide these advantages.



EASY, BURN-OUT COLLAPSIBILITY:

Because cereal binder burns out rapidly and completely during casting, you are sure of ready collapsibility and easy shake out when you use Truscor or Amerikor.

For better, lower-cost cores, place a trial order for Krause Cereal Binders now — Truscor, if you like a light weight binder; Amerikor, if you prefer a heavier weight. Call any one of the distributors listed below or write us direct.

CHAS. A. KRAUSE MILLING CO., Milwaukee 1, Wisconsin

World's Largest Millers of Dry Corn

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DISTRIBUTORS

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Richmond 21, Va.

Foundry Supplies Co.
Chicago 16, Ill.

J. H. Hatten
Lansdowne, Pa.

Schuler Equipment Co.
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Independent Foundry Supply Co., Los Angeles 11, Calif.

Marthens & Co.
Moline, Illinois

Carl F. Miller & Co.
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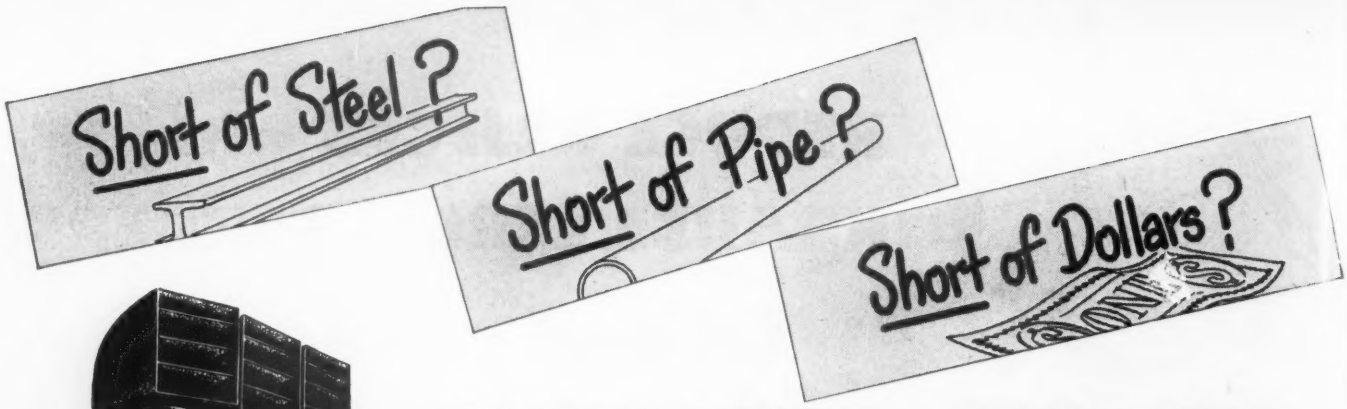
533-543 Second Street
San Francisco 7, California

Frederic B. Stevens, Inc.
Buffalo 12, N. Y.

Frederic B. Stevens, Inc.
Cleveland 14, Ohio

Frederic B. Stevens, Inc.
Detroit 26, Mich.

Frederic B. Stevens, Inc.
166 Brewery Street
New Haven 11, Connecticut



DRAVO HEATERS SAVE STEEL,

MONEY—FUEL—and MAN HOURS

The steel needed for a heating system *can* be slashed from 50% to 70% for the representative open-space industrial structure shown below . . . by using the direct-fired warm air heating method with Dravo "Counterflo" Heaters! This conservation of steel, vitally important today, adds another saving to the long list of economies in money, fuel and labor effected by this heating method.

The chart below gives the detailed comparative story. Every system is equivalent in Btu output. Steel requirements for the 13 methods have been carefully and conservatively calculated.

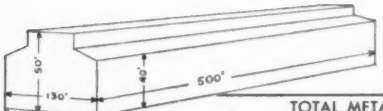
You will see that Dravo Heaters not only take LESS steel in each fuel classification . . . but that the HIGHEST steel requirement in a Dravo installation is *almost 50% less* than the LOWEST steel requirement in *any other* system!

Look at the contrast in *pipe* required! Jobs now held up by slow pipe deliveries can MOVE . . . if Dravo heaters are used!

Dravo "Counterflo" Heaters can expedite installation jobs for you! And the steel and pipe savings are just two of the many reasons why more and more "Counterflo" Heaters are being used in all types of structures.

DRAVO HEATERS HAVE EARNED HIGHEST INDUSTRIAL ACCEPTANCE BECAUSE THEY OFFER—

- **LOW FIRST COST... Users report 50% to 60% savings**
- **WORKING-ZONE WARMTH . . . Units heat 4,000 to 20,000 sq. ft.**
- **NO FUEL WORRIES . . . Burn oil or gas . . . readily converted**
- **AUTOMATICALLY CONTROLLED . . . On-off or modulating controls**
- **LOW OPERATING COST...80-85% efficiency**
- **EASY INSTALLATION . . . Fuel, electric and exhaust connections only**
- **LONG LIFE—LOW MAINTENANCE . . . Stainless Steel combustion chamber**
- **TESTED—APPROVED . . . AGA and/or UL seal**
- **AVAILABLE...Immediate delivery, no delays**



Each heating system compared below was sized to make up a calculated 12,000,000 Btu heat loss in this representative industrial building.

WRITE TODAY FOR BULLETIN KL-526-24

TOTAL METAL REQUIREMENTS FOR VARIOUS HEATING SYSTEMS WITH IDENTICAL 12,000,000 Btu LOAD

	GAS FIRED					OIL FIRED					COAL FIRED		
COMPONENT	DRAVO WARM AIR	HIGH PRESSURE CONVENTIONAL WATER TUBE BOILER	HIGH PRESSURE PACKAGED STEAM GENERATOR	LOW PRESSURE CONVENTIONAL WATER TUBE BOILER	LOW PRESSURE PACKAGED STEAM GENERATOR	DRAVO WARM AIR	HIGH PRESSURE CONVENTIONAL WATER TUBE BOILER	HIGH PRESSURE PACKAGED STEAM GENERATOR	LOW PRESSURE CONVENTIONAL WATER TUBE BOILER	LOW PRESSURE PACKAGED STEAM GENERATOR	DRAVO WARM AIR	HIGH PRESSURE CONVENTIONAL WATER TUBE BOILER	LOW PRESSURE CONVENTIONAL WATER TUBE BOILER
BASIC HEAT GENERATORS	26,400	38,000	62,000	38,000	62,000	26,400	38,000	62,000	38,000	62,000	27,450	38,000	38,000
PIPING—Oil—Steam Boiler Room—Gas	9,096	15,490	15,490	35,308	35,308	4,352	15,790	15,790	35,608	35,608		14,990	34,808
TANKS—Oil—Blow-off Condensate		3,500	1,500	1,500	1,500	13,000	16,500	14,500	14,500	14,500		3,500	1,500
UNIT HEATERS including Traps & Starters		21,240	21,240	21,240	21,240		21,240	21,240	21,240	21,240		21,240	21,240
STACKS & BREECHING	1,200	4,000	400	4,000	400	1,200	4,000	400	4,000	400	1,200	4,000	4,000
PUMPS—Fuel Oil Auxiliary Oil—Boiler Feed		1,000	1,000	1,000	1,000	400	1,400	1,000	1,400	1,000		1,000	1,000
STOKERS & FANS—including Dust Collectors Fuel Oil Preheaters							2,000		2,000		23,850	15,000	15,000
STRUCTURAL STEEL Boiler House Foundation Reinforcing		7,000	2,000	7,000			7,000	2,000	7,000			7,000	7,000
TONS of STEEL REQUIRED	DRAVO **18**	**45**	**52**	**54**	**61**	DRAVO **23**	**53**	**58**	**62**	**67**	DRAVO **26**	**52**	**61**

DRAVO CORPORATION

HEATING DEPARTMENT, DRAVO BUILDING, PITTSBURGH 22, PA.

Sales Representatives in Principal Cities

Manufactured and sold in Canada by Marine Industries, Ltd., Sorel, Quebec

(*Concluded from page* 132)

as wet or oily borings or metal used as melt stock, incompletely dried refractory lining, patches, or ladles, and moist sand adhering to foundry returns. Melt stock should be dry and clean to obtain highest quality castings, especially pressure work.

Activated or finely divided carbon can result from improper operation of indirect arc furnaces. Usually, but not necessarily, the carbon can be noticed as a black smoke and is caused by one or more of the following malpractices: 1. Low voltage across arc. 2. Excessive power input exceeding capacity of electrodes. 3. Wet or soft graphite electrodes. 4. Misalignment of electrodes. 5. Shorting of electrodes through charge. The effect of these malpractices and the corrective measures usually employed are:

a. If voltage is low, excessive current is necessary to reach rated power input. Excessive current causes graphite to flake off electrodes, and the electrician should change transformer tap settings. Transformers usually have both voltage and reactance tap changers. The no-load voltage at furnace should be at, or above, rated value and full-load voltage 20-25 volts lower. If full-load voltage is less than indicated: Too much reactance is in circuit, and reactor tap should be changed; primary voltage is dropping under load, indicating insufficient capacity in power lines; loose electrical connection, either in bus bar or in electrode joints, can cause voltage drop. Electrode joints should be snug and no joint compound is necessary.

b. Excessive power input can cause electrodes to spall. Again, the transformer taps should be changed. Either the voltage to furnace should be lowered, or the reactance of transformer should be increased, or both should be made.

c. If electrodes are wet, the heat transferred from the arc can cause spalling of electrodes from steam generation. The electrodes should be stored in a dry place and heated at 250° F if they do become wet during storage or shipment.

d. Misalignment of electrodes is characterized by tapered ends which present an abnormal arcing area. This leads to excessive current loads upon the electrodes, again causing spalling and smoking. Also, it will be difficult to hold power input level. Tapered electrodes should be rotated until arcing takes place across the points or the tips should be knocked off, outside the furnace. Arcing should produce a fairly well rounded end on the electrodes, and the diameter of the electrodes should be as specified within 3 in. of the arcing end. It is necessary to realign from the electrode clamp carriage to correct this condition. New electrodes should be within ¼-in. of perfect alignment with each other over the entire length of travel within the melting chamber.

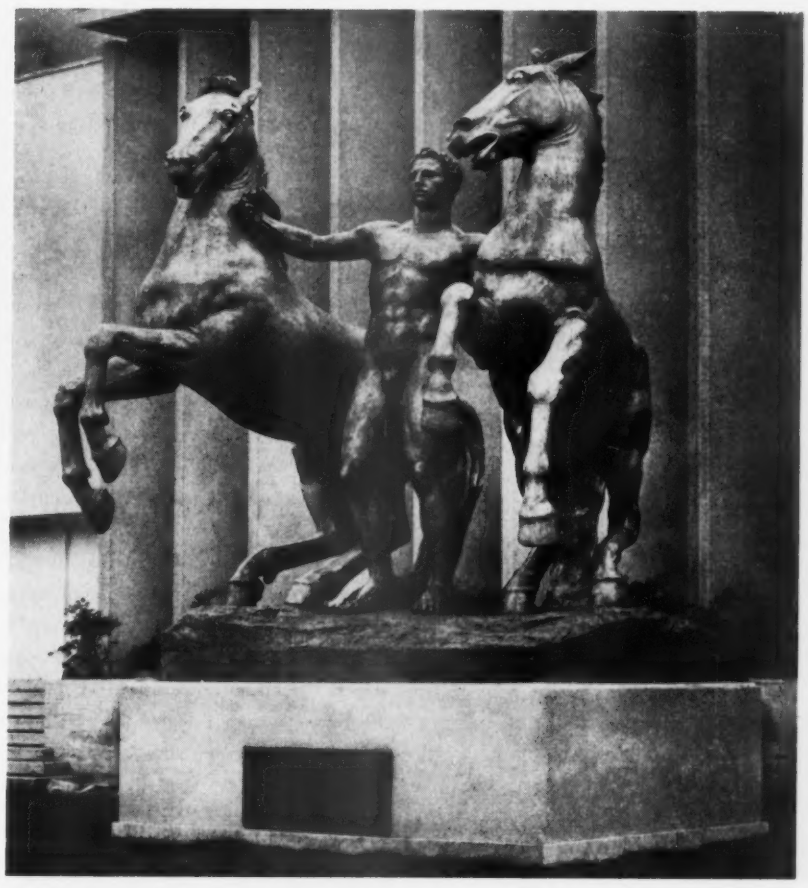
e. If heavy pieces of metal fall or are placed against electrodes, shorts develop at point of contact with consequent overloading of electrode capacity, again causing spalling.

As the need for higher quality castings becomes more widespread, the controls over melting practice for leaded tin bronze castings must necessarily become more rigid. Quite understandably, these controls and practices have been used for years by those foundries producing large tonnages of pressure castings from metal melted in indirect arc furnaces. It is hoped that these practices will be better understood by all to keep the quality of bronze castings high.

Report Covers Executive Health Examinations

Programs for safeguarding the health of executives, particularly in periods of industrial mobilization such as the country now faces, are contained in a report issued by Policyholders Service Bureau, Metropolitan Life Insurance Co., One Madison Ave., New York 10. It is based on a survey of companies attempting to conserve executive manpower through periodic health examinations.

Information obtained is presented on the benefits of health examination programs; the situation in small companies; the executive levels included; the scope, cost and frequency of examinations; use of company-employed and outside physicians; confidential treatment of information; follow-up procedures; forms and records employed, and examination procedures followed by clinics.



HORSEPOWER: This large cast aluminum sculpture group was made in Italy for the Resia Lakes hydroelectric power station of the Montecatini Society. It weighs about 8000 pounds, is approximately 14 feet high and measures 8x11 feet at the base. The figures were cast by the lost wax method from an aluminum alloy known as Corrofond S 4. This alloy includes 4.2 per cent silicon, 0.5 per cent manganese and 0.15 per cent titanium. The work was executed under the guidance of technicians of Istituto Sperimentale dei Metalli Leggeri, Milan, Italy. Photo furnished through courtesy of the institute

INDUSTRY ADVISORY COMMITTEES

BOTH the National Production Authority and the Office of Price Stabilization, Washington, have appointed committees from various industries to advise these agencies on matters connected with the defense effort. The committees are selected to provide a representative cross section of the individual industries, both geographically and by size of company. Advisory committees to NPA are concerned primarily with production and raw material supply problems. OPS committees advise on subjects relating to the preparation, issuance and modification of price regulations. Among the committees appointed to date are a number identified with the foundry industry. Members of these groups are listed here.

OFFICE OF PRICE STABILIZATION

GRAY IRON FOUNDRY INDUSTRY

R. T. Lewis, secretary, Kenn Foundry Co., Griffith, Ind.
C. R. Culling, president, Carondelet Foundry Co., St. Louis.
H. L. Edinger, president, Barnett Foundry & Machine Co., Irvington, N. J.
Philip Frankel, secretary-treasurer, Superior Foundry, Inc., Cleveland.
Wm. W. C. Ball, vice president, Taylor & Fern Co., Hartford, Conn.
S. D. Russell, president, Phoenix Irons Works, Oakland, Calif.
R. E. Kucher, president-treasurer, Olympic Foundry Inc., Seattle, Wash.
J. W. Simmons, Jr., secretary-treasurer, Cox Foundry & Machine Co., Atlanta, Ga.
G. F. Hutchins II, treasurer, Standard Foundry Co., Worcester, Mass.
E. P. Trout, assistant to president, Lufkin Foundry & Machine Co., Lufkin, Tex.
E. M. Smith, American Brake Shoe Co., New York.
W. Chadwick, president, Davenport Besler Corp., Davenport, Iowa.
Ed. B. Sherwin, president, Chicago Hardware Foundry Co., North Chicago, Ill.
E. M. Knapp, president, Ferro Machine & Foundry Inc., Cleveland.
E. R. Jones, vice president, Lakey Foundry & Machine Co., Muskegon, Mich.

IRON AND STEEL SCRAP

G. I. Stout, Luria Bros. & Co., Philadelphia.
Edward L. Solomon, Max Solomon Co., Pittsburgh.
William J. Wolf, David J. Joseph Co., Cincinnati.
Alex Miller, Columbia Iron & Metal Co., Cleveland.
Barney L. Keywell, Samuel G. Keywell Co., Detroit.
Leo J. Kelleher, Southern Converting Co., Greensboro, N. C.
C. C. Cohen, I. J. Cohen & Co., Kansas City, Kans.
Max L. Kimerling, M. Kimerling & Sons Inc., Birmingham.
Marshall A. Shapiro, California Metals Co., Oakland, Calif.
Leon Goldstein, Paper-Calmenson & Co., St. Paul.
A. W. Snyder, Bethlehem Steel Co., Bethlehem, Pa.
Roy Warshawsky, chairman, National Auto Wreckers Assn. Inc., Chicago.
Walter Erman, Erman-Howell Div., Luria Steel & Trading Corp., Chicago.
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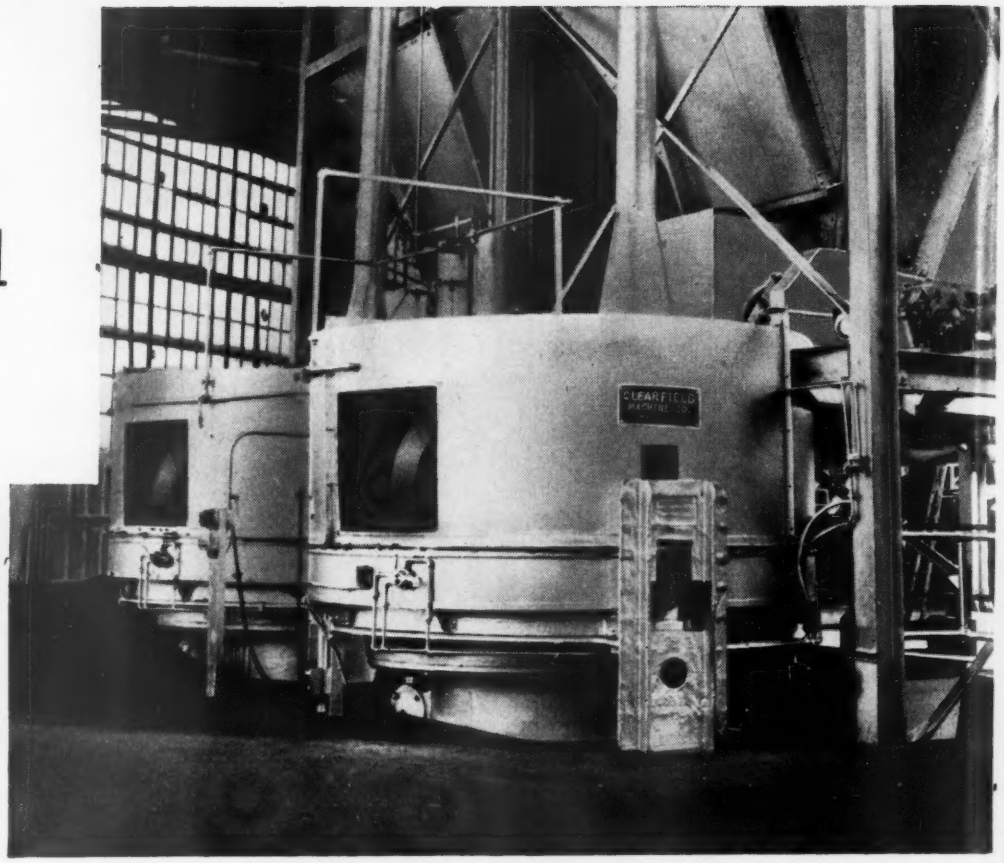

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New Soap Cuts Industrial Dermatitis

By RALF B. TRUSLER
Director of Research
Davies-Young Soap Co.
Dayton, O.

FOR many years industrial dermatitis has been a source of irritation to both the employees and management of foundries. No figures are available to determine its cost, but in any plant where it occurs it is a perennial headache. One reliable authority has estimated that 65 per cent of all lost time in industry may be traced to various skin diseases classified under industrial dermatitis.

This condition is most prevalent where the employees' hands and arms are in contact with solutions or compounds that have a tendency to de-fat the skin, causing cracking. The presence of bacteria on and in the skin, ready to enter and infect these lesions, is, to a large extent, responsible for dermatitis among these workers. The precaution of using an antiseptic agent for washing will substantially reduce infections.

Many antiseptic agents, however, have been unusable in foundries because they were too strong, too poisonous, or too evil-smelling. Now, after many years of experimentation, a safe antiseptic soap has been found that points the way to a substantial reduction in industrial dermatitis. This antiseptic soap is based on the use of one compound, hexachlorophene.

Report after report in medical and chemical journals has substantiated several facts about hexachlorophene. Foremost is its bacteria killing power. In particular, it is effective against those bacteria causing boils, furuncles, and suppurating wounds. While it does not destroy all such bacteria, it does kill the majority and inhibit the growth of new ones.

Hexachlorophene does not react with soap constituents or with the moisture contained in soap. It is not volatile nor does it have a disagreeable odor. It is non-toxic with normal usage and does not stain skin. Best of all, it does not irritate or sensitize the skin.

Before it was introduced to the public, hexachlorophene underwent a number of scientifically controlled tests. The compound's impact on skin bacteria was first tested for its results in surgical antisepsis. The results were an eye-opener. Surgeons found they could dispense with the normal scrub-up prior to an operation by substituting a hexachlorophene soap. A two-minute wash would reduce bacteria more than a ten or twenty-minute scrub with hard-bristle brushes and evil smelling antiseptics.

When a hexachlorophene preparation is used, it deposits an invisible film on the skin. This film does not wash off and only disappears as skin regenerates approximately every seven days. This film makes an active attack against the bacteria, killing the life processes.

The skin eruptions which hexachlorophene aids in preventing are caused either by bacterial infection or re-infection by bacteria in the blemishes. Sources of these bacteria are everywhere. They are in dust, dirt, office machines, and machines along the production line. They are constantly present in the washrooms and shower stalls. Literally hundreds of thousands of these tiny organisms are placed on the skin every day. Without a hexachlorophene preparation, the only protection is the skin itself.

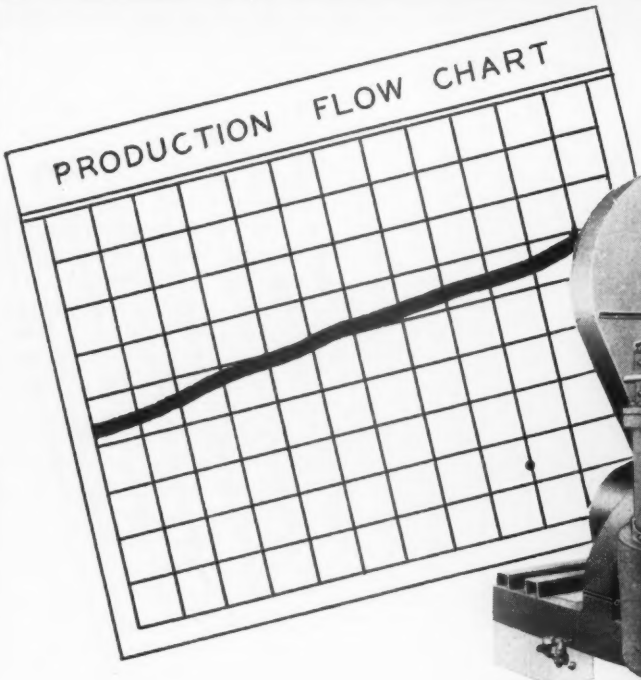
To obtain the antibacterial effects of hexachlorophene requires only its use in normal cleansing routines. However, best results are obtained by regular use. Such preparations as a liquid soap or, for women, a line of basic cosmetics which has recently appeared on the market, are suitable. In many factories, the liquid soap is placed in wash and shower rooms where workers wash up before lunch and after work. The degerming effects of diluted hexachlorophene liquid soap makes this economically feasible even for large foundries.

Although the primary use of hexachlorophene preparations is to maintain a low bacteria count, the compound also kills perspiration odor. Normal perspiration is odorless, becoming offensive only when bacteria attack and decompose the organic matter contained in it. Hexachlorophene kills these bacteria.

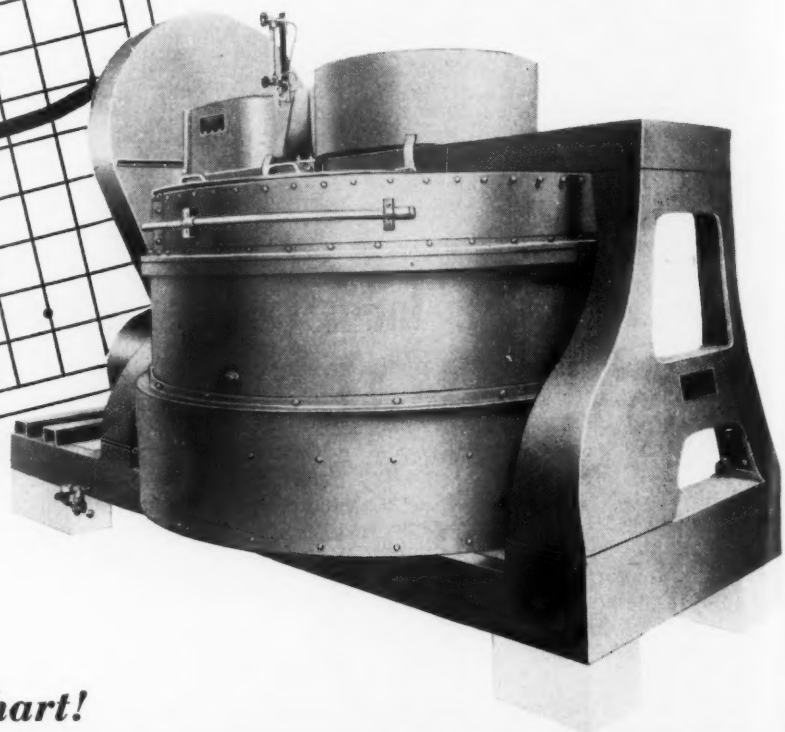
While it would be encouraging to say that hexachlorophene would rid a person's skin of all blemishes, such is not the case. Many blemishes are caused by internal disorders and should be treated by a physician. Hexachlorophene does not destroy all bacteria. However, it does materially reduce bacteria and will maintain this reduction if used regularly. And it can lessen the number of bacterial infections and re-infections.

The antiseptic effects of hexachlorophene should not be confused with that of stronger compounds. It does kill bacteria on and in the skin but it is not recommended for treatment of open wounds. In some cases, it may speed the healing process of small broken eruptions. It does have its limitations but, when used according to directions, can produce a marked reduction of blemishes caused by external sources.

Basis of the new antiseptic soap is hexachlorophene. When added to liquid soap as normally used in plant washrooms it kills most of the bacteria on the skin



Smoother Materials Flow through the mixer . . .



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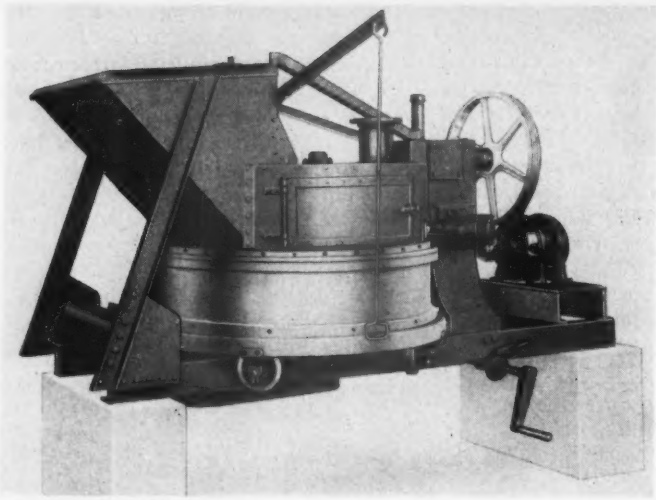

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STANDARD SPECIFICATIONS FOR PEARLITIC MALLEABLE IRON CASTINGS

ASTM Designation A 220-50

Scope

1. These specifications cover pearlitic malleable iron castings for railroad, motor vehicle, marine, agricultural implements, and general machinery purposes, both for general use and for localized hardening purposes.

Process

2. The iron shall be made by one of the following processes: air-furnace, open-hearth, electric-furnace, or any of the multiplex processes.

Physical Properties

3. (a) The tension test specimen made according to Section 4 shall conform to the minimum requirements as to tensile properties prescribed in Table I.

(b) The yield point or yield strength shall be determined in accordance with the Standard Methods of Tension Testing of Metallic Materials (A.S.T.M. Designation: E 8). For materials of low elongation the determination by the drop of the beam or halt in the gage may be difficult or impossible.

Table I—Tensile Requirements*

	Grade 43010	Grade 48005	Grade 53004	Grade 60003	Grade 70002
Tensile Strength, min., psi.†	60,000	70,000	80,000	80,000	90,000
Yield Point or Yield Strength, min., psi.†	43,000	48,000	53,000	60,000	70,000
Elongation in 2 in., min., per cent	10	5	4	3	2

* Typical Brinell hardness number ranges of the grades of material in this table are as follows:

Grade	Typical Brinell Hardness Number Range
40310	163 to 207
48005	179 to 228
53004	197 to 241
60003	197 to 241
70002	241 to 285

† It is recognized that higher tensile and higher yield strengths may be obtained from any of the grades of material in the table by the use of a conventional quench-and-temper treatment.

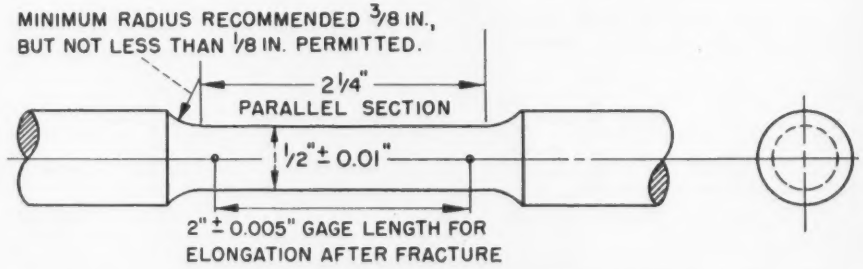
(c) When specified for localized hardening processes, the selected grade designation shall be preceded by the letter "L", for example, L48005, L60003, etc. Such castings shall contain sufficient carbon in such combined form as to allow satisfactory induction, flame, or other localized hardening. A brinell hardness number of 197, minimum, is recommended. Free ferrite shall be as low as consistent with other properties.

Test Specimens

4. (a) At the option of the manufacturer and by agreement with the purchaser, machined test bars taken from any convenient coupon and machined according to Fig. 1 may be used. Unless otherwise agreed upon, cast test bars conforming to Fig. 2 or Fig. 3 shall be used.

(b) The manufacturer shall cast three or more test specimens from each heat in batch melting or during multiplex melting at least every four hours without chills, using heavy risers of sufficient height to secure sound bars. All specimens shall be suitably identified with the heat number in batch melting and with the pour period in multiplex melting.

(c) All test specimens shall be heat treated in regular production equipment as nearly as possible with castings which were made during the same operating heat or period.


MINIMUM RADIUS RECOMMENDED 3/8 IN., BUT NOT LESS THAN 1/8 IN. PERMITTED.
2 1/4" PARALLEL SECTION
1/2" ± 0.01"
2" ± 0.005" GAGE LENGTH FOR ELONGATION AFTER FRACTURE

NOTE: THE GAGE LENGTH, PARALLEL SECTION, AND FILLETS SHALL BE AS SHOWN, BUT THE ENDS MAY BE OF ANY SHAPE TO FIT THE HOLDERS OF THE TESTING MACHINE IN SUCH A WAY THAT THE LOAD SHALL BE AXIAL.

Fig. 1—Machined tension test specimen

Number of Tests

5. (a) The manufacturer shall test at least one heat treated tension test specimen from each heat of batch melting or from each pour period of multiplex melting and shall record the results, except those of flawed bars, in permanent records. Such records covering the operating periods during which the purchaser's castings were produced should be available for examination by the purchaser's representative.

(b) The purchaser's representative may select and test tension specimens representing the approximate operating period during which the purchaser's castings were produced. The test results of flawed bars shall be

STANDARD SPECIFICATIONS FOR PEARLITIC MALLEABLE IRON CASTINGS

ASTM Designation A 220-50

discarded and duplicate bars shall be tested.

(c) Instead of conducting tests as provided in Paragraph (b), the representative of the purchaser may elect to examine the manufacturer's test records for the approximate period during which the purchaser's castings were produced. He may further request certified copies of any representative tests which he may select.

(d) At the option of the purchaser or his representative, a casting of each design ordered may be tested to destruction, or otherwise broken up, to determine the presence of any manufacturing condition which may be detrimental to the serviceability of the castings.

Reheat Treatment

6. Any casting rejected may be reheat treated. Test specimens shall be reheat treated in the same manner and shall be accepted if they fulfill

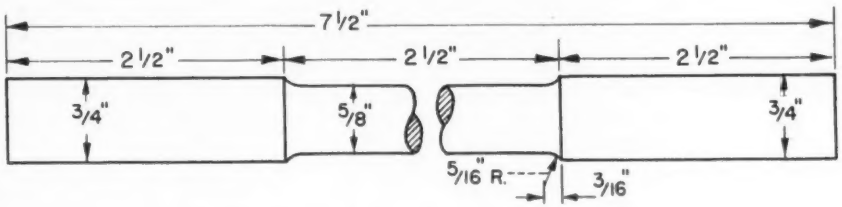


Fig. 2—Unmachined tension tests specimen

the requirements of the specifications in accordance with Section 3.

Permissible Variations in Dimensions

7. A variation of 1/8-in. per ft in any dimension will be permitted.

Workmanship

8. The castings shall be made in a workmanlike manner and shall conform substantially to the patterns or drawings furnished by the purchaser, and also to the gages which may be specified in individual cases.

Quality

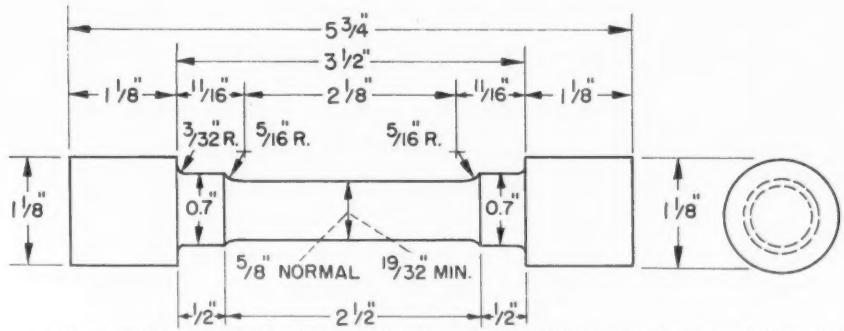
9. All castings shall be substantially free from massive (primary) cementite, primary graphite, shrinks, cold shuts, cracks, injurious porosity, or other defects making the castings unsuitable.

Marking

10. The identification mark of the manufacturer and the pattern numbers aligned by the purchaser shall be cast on all castings of sufficient size, in such positions that they will not interfere with the service of the castings.

Inspection

11. (a) The inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works that concern the manufacture of the material ordered. The manufacturer shall afford the inspector all reasonable facilities, without charge, to satisfy him that the material is being furnished in accordance with these specifications. All



Note—Modifications may be made in the dimensions indicated above for those details of the specimen outside of the gage length as required by testing procedure and equipment.

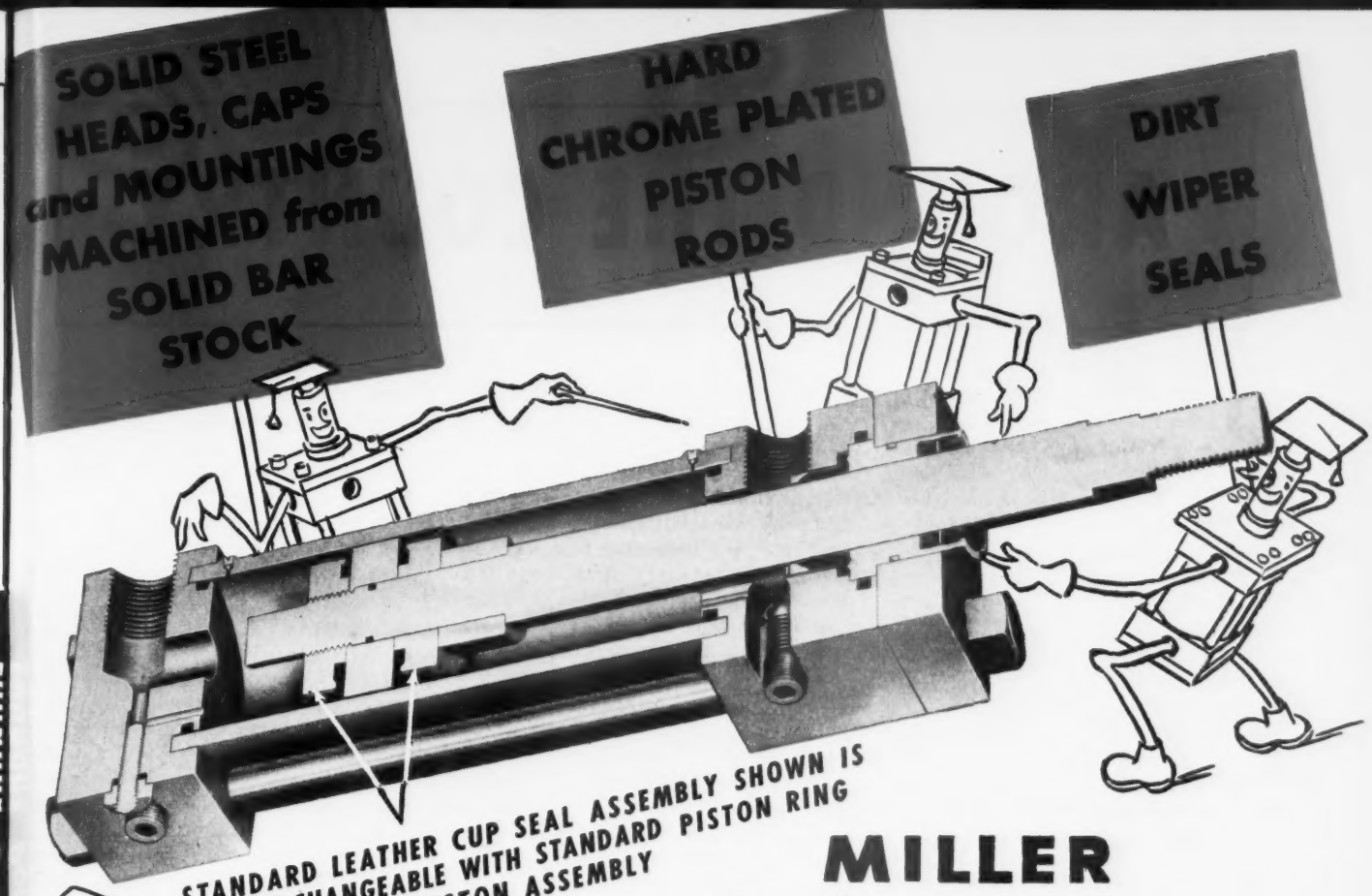
Fig. 3—Alternative unmachined tension test specimen

tests and inspection shall be made at the place of manufacture prior to shipment, unless otherwise specified, and shall be so conducted as not to interfere unnecessarily with the operation of the works.

(b) The manufacturer shall be required to keep a record of each melt from which castings are produced, showing tensile strength and elongation of test specimens cast from such melts. These records shall be available and shown to the inspector whenever required.

Rejection

12. Material that shows injurious defects subsequent to its acceptance at the manufacturer's works may be rejected, and if rejected shall be replaced by the manufacturer without charge to the purchaser.



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Sales and Service from coast to coast

AROUND THE COUNTRY

DETROIT — Michigan's lead in armament contracts has relieved foundrymen of earlier fears that this area was being bypassed. At that time the outlook was that automotive production and supporting activities would decline before defense work took its place. There are now few foundrymen who believe this is likely.

In the first place, civilian production remains at a higher level than anyone expected three or four months ago, in view of materials restrictions. Secondly, the war-or-peace types of industries, such as machine tools, are offering abnormal opportunities for foundries. Thirdly, the strictly military programs are developing at a rapid enough pace that they bid to overtake civilian work.

With 11 aircraft engine contracts already in hand or in advanced stages of negotiation, the automakers will be a dominant factor in this production, as they were in World War II. These, of course, are in addition to tank orders and other military vehicle contracts which already are requiring castings in volume.

For most foundries in the area, however, this work continues to be an incidental part of total volume. The high-production foundries, principally those of the auto makers, are operating at high levels, limited only by their ability to obtain materials. The inventory situation on basic raw materials is in most cases touch-and-go. Pig iron, scrap and coke are all tight, no one material being in critical supply for all consumers. Alloying elements are the bottleneck for several shops, and incidental maintenance items occasionally are reported as chokepoints to production.

Foundry equipment of all kinds is in strong demand, the need for greater mechanization being apparent to foundrymen who are acutely aware of the manpower shortage. Builders are booked ahead for months, a major customer being Ford's Cleveland foundry and its revamped Dearborn facility. Troubled by the same kind of materials shortages which are plaguing all metalworking industries, some of the builders report that virtually completed equipment is held up for lack of a few components.

CHICAGO—The government's cast armor plant in East Chicago, Ind., which American Steel Foundries built and operated during World War II is now under reactivation by that company. Rehabilitation is well under way and key personnel has been designated. The plant first went into operation late in 1942 and produced cast armor for tanks. It has six open-hearth furnaces with annual capacity of 108,000 tons. Cost of rehabilitation is reported to be excessively high because of governmental neglect of the plant in recent years.

Meanwhile Ford Motor Co. is pushing work in readying its Aircraft Engine Division plant, the former Dodge Chicago plant of Chrysler Corp., to build 28-cylinder Pratt & Whitney Wasp Major engines.

The speed with which a new 800-line dial telephone system was installed in the Ford plant is indicative of the pressure being exerted to prosecute the tooling up program. The system required more than 11½ million feet of wiring and Illinois Bell Co. spokesmen state the installation was completed in about half the time normally required for such a project.

Closer co-operation between the foundry industry and the 34 high schools in this area offering shop courses is the goal of the Educational Committee of the Chicago Chapter, AFS. The committee, headed by Roy W. Schroeder, assistant professor, foundry and pattern laboratories, Navy Pier Branch, University of Illinois, has held two meetings recently. By next fall, the program is expected to be in operation. It will be a two-way proposition. It will provide an opportunity for foundry executives to visit high schools to observe shops in operation and for students to make inspection trips through foundries to observe the production of castings. Another objective of the committee is to publicize the program to foundries and schools nationally as a means of stimulating interest in high school graduates to enter the foundry field.

The foundry and pattern laboratories proved the high points of interest in the annual open house which Navy Pier Branch of the University of Illinois held Apr. 11-12. More than 4000 visitors were shown through these departments on the two days.

These laboratories and the courses of instruction were organized by Robert E. Kennedy, secretary emeritus of AFS, when the university branch was established in 1946. Since that time he has served as instructor.

* * *

LOS ANGELES—A scant 30 days ago foundrymen generally wore an air of "we're not worried" when discussing raw materials shortages. Now raw materials are in such short supply that all other problems take a back seat. Even sources for supplies previously described as "dependable" are drying up.

Foundries blame the steel scrap shortage on the government price regulation which in this district raised prices of steelmaking scrap but rolled back foundry grades. Scrap dealers say price ceilings caused profit margins on foundry scrap to drop almost 50 per cent. Dealers prefer to handle the more expensive steelmaking scrap, and collections on cast scrap have fallen steadily. Trade observers say the smaller profit margin on foundry scrap, coupled with mill practice of earmarking, puts the foundries on the spot. One steel foundry which before price ceilings stocked scrap sufficient for 4-6 weeks production is now down to 1-2 weeks supply. Foundrymen here say the only avenue to more scrap is to have higher ceiling prices.

The scrap shortage, critical as it is, was not enough to bring forward any foundry to air its troubles before the House of Representatives Committee on Small Business which held hearings in Los Angeles, Apr. 4-5. No foundries were included among the fifty small businesses that took advantage of the opportunity afforded by the Committee to speak directly with NPA, OPS, RFC and military procurement officials concerning their problems arising from the national emergency.

Foundries are making every effort to keep current 2-3 months' backlogs from extending. Most customers desire 4-6 weeks' delivery and foundrymen prefer to see backlogs where they are. DO backlogs are increasing. Heavier DO backlogs are now

(*Concluded on page* 147)

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Well burned to assure high density, low porosity and uniform dimensions. Excellent resistance to slags, spalling and abrasion.

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Smooth, plastic fire clay with good refractoriness and low drying shrinkage. Ground and screened to about 12 mesh with particle sizes ranging downward to micron size. Most widely used ground fire clay on the market.

GOOSE LAKE FIRE CLAY FLOUR

Extra fine clay for bonding sand, laying fire brick and for mixing cupola and ladle linings. Finely pulverized, works readily with water, spreads easily.

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For bonding foundry molding sands—especially malleable, hard iron and light to medium grey iron castings. Grundite bonded sands improve casting finish, reduce scrap and help produce castings closer to pattern size.

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Made with Goose Lake Fire Clay and angular silica, ground and screened to produce a dense lining with high resistance to slag and erosion from the charge. High adherence for manual or gun application.

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Don't be bashful. Send for your trial order today. We guarantee that you'll be satisfied.

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If you don't agree that SUPER-ANNEALSHOT and GRIT are the best and most economical malleable abrasives you've ever used— return the unused quantity for refund— AT OUR EXPENSE.

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(*Concluded from page* 144)

divided into "good" rated orders and DO-97's. MRO, late in hitting the far West, is now flooding suppliers' books. Most foundrymen have trouble deciding the priority DO-97 work is to receive. One foundry increased its percentage of "good" DO's against total orders from 5 per cent to 35 per cent last month.

One steel foundry has received a subcontract from an eastern prime for 400-500 tons of tank armor plate; it is believed to be the first contract of its type on the West coast for armor plate.

* * *

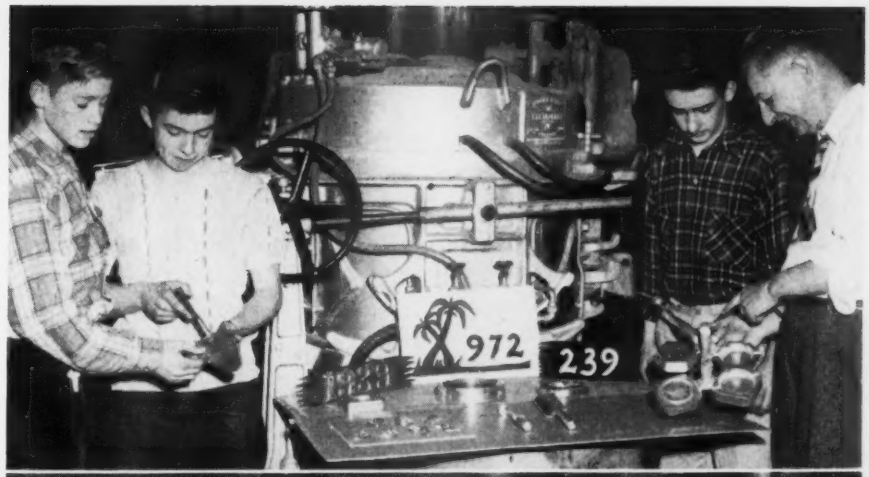
PHILADELPHIA — Defense load among district foundries is heaviest at nonferrous and steel foundries. Nonferrous operators report that close to 80 per cent of their production carries ratings. Steel foundries are doing a big business in tonnage for combat tanks, also steel castings for airplanes. Plane components, such as brackets etc., are not heavy, but numerous.

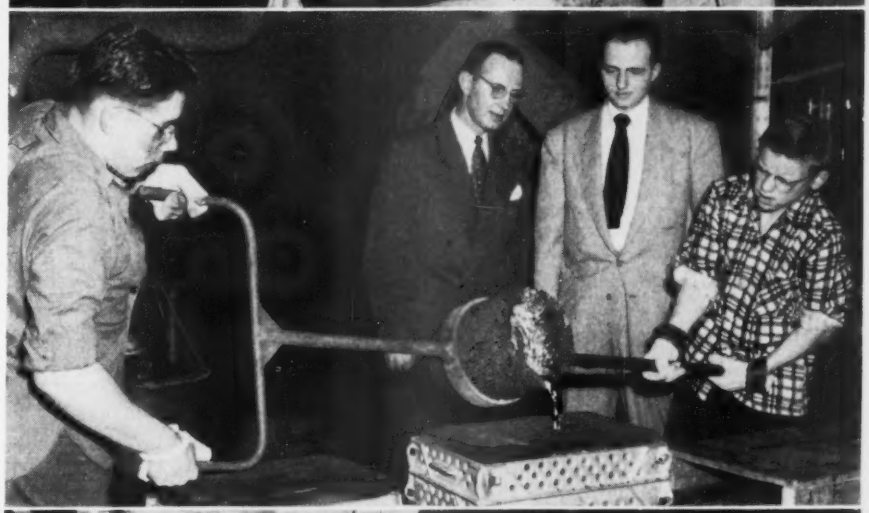
Malleable shops have less rated work than nonferrous and steel foundries, while it is estimated that gray iron foundries average less than 5 per cent.

The rapid rise in rated work at nonferrous foundries has relieved considerably the raw materials problem they faced up to a few weeks ago. For such rated work they are now able to obtain a better supply of copper, tin, aluminum, zinc and other scarce items. Currently, manpower is their biggest bottleneck. Actually skilled manpower constitutes a problem with all foundries, but until recently the raw materials supply at nonferrous plants has been so severe as to fairly overshadow manpower as the No. 1 difficulty.

Foundries generally are still working five days a week, although there are exceptions, such as iron pressure pipe plants which are working Saturdays with more or less regularity. They may not necessarily pour heats on Saturdays but at least some departments are operating. At most steel foundries operations continue into the sixth day and notwithstanding these high operations steel foundries are steadily falling behind on orders. District steel foundries average about a 16-week backlog. Gray iron backlogs average closer to ten weeks. Malleable foundries have extended backlogs but not as heavy as the steel foundries.

Gray iron foundries find scrap and pig iron scarce. In the case of scrap they not infrequently have to pay the price for premium grades to get what they want. Coke supply is easier.





Crane World photos

AMERICANISM: Crane Co., Chicago, under the Junior Achievement Inc. program, is sponsoring the JA Aluminum Co. (tradename JALCO) which recently was organized in Chicago by 16 Tilden Technical High School boys, ages 15 to 18, to make and sell cast aluminum products. In the Junior Achievement Inc. program, business concerns sponsor junior firms to provide youth with first-hand experience in the free enterprise system. JALCO rents foundry facilities at the Chicago Museum of Science and Industry. This model foundry was donated to the museum by Crane Co. At top, W. J. Clark Jr. (right), superintendent at Crane Co.'s Chicago Works, explains production points to JALCO members. Typical products of the company are shown. Center photo shows Eugene Van Buren (second from left), Junior Achievement official, and H. V. Jones, Crane Co. auditor, watching two JALCO members pour a mold. Bottom photo shows John Juraska (second from right), foundry foreman, Crane Co. Chicago Works

By EDWIN BREMER

Foundry DEVELOPMENTS

FOUNDRY wishing to stamp an impression on a mold just after it has been moistened with blacking, places a piece of toilet paper on the mold and stamps through the paper. This prevents sticking and the paper is burned as the mold is dried with a gas flame.

* * *

SMALL AIR leaks can be costly, according to *Compressed Air* magazine. Its March issue mentions one firm saving $100,000 and another estimating a saving of $1 million through a program of air valve replacement, removal of unnecessary piping, use of proper size air outlets or nozzles, use of automatic shutoff devices, elimination of use of air by employees for personal cooling and cleaning purposes, etc. While foundries may not be able to show such spectacular savings, it will be worthwhile to make routine checks to see that air wastage through leakage, etc. is held to the minimum. Use of adequate aftercoolers for the compressors and installation of separators at strategic points in the air-distribution system will eliminate the necessity for operators to blow condensed moisture out of the line before connecting it to a tool.

* * *

APPLICATION of calcium carbide for removal of sulphur in gray iron is discussed in an article in the April issue of *Journal of Metals* by S. D. Baumer and P. M. Hulme. They conclude that, when properly applied, carbide can remove better than 90 per cent of the sulphur. About 10 to 12 lb carbide is required per pound of sulphur removed. Efficiency appears to be independent of the sulphur level in the metal and the temperature, at least in the range 2550 to 2850° F. Process is more expensive than conventional soda treatment, ranging from 75 cents to $2 per ton of metal treated, depending on quantity of S to be removed. S levels in 0.01 to 0.02 per cent range are easily attainable, even when starting S is as high as 0.20 per cent. In the investigation the calcium carbide was injected under the surface of the molten metal by use of nitrogen.

* * *

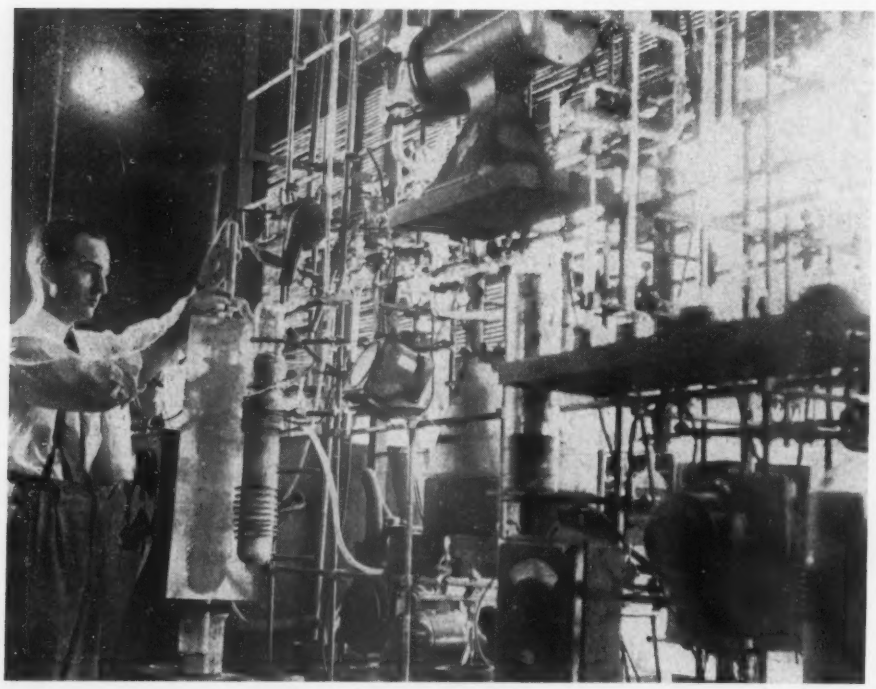
AMERICAN Standards Association, 70 East 45th St., New York 17, has issued a new standard safety code for "Ventilation and Operation of Open-Surface Tanks" Z9.1-1951. Operations involving the immersion of materials in liquids and their subsequent removal are covered. These include electroplating, washing, anodizing, pickling, quenching, dipping, degreasing, alkaline cleaning, stripping, rinsing and digesting. Safety of the operator is the primary concern of the standard, and provisions protect him from contact with gases, vapors, mists or liquids involved in any open-surface tank operations which might cause injury to health. Copies of the standard may be obtained for 75 cents each.

* * *

STRICKLING machine for production of loam molds, described in U. S. Patent No. 2,532,634, is arranged somewhat like a radial drill in that it comprises a pedestal which supports an arm or cross beam on which the strickle is mounted. Strickle is rotated by an electric motor on opposite end of arm through a shaft on which a worm is slidably mounted and a gear. Strickle mechanism is movable along the arm, and the arm movable vertically on the pedestal. Strickle template holder also may be moved up and down on its shaft. Circular or eccentric molds may be made, and it is claimed that accurate contours can be obtained much more rapidly than by hand.

* * *

SIMPLE, rapid procedure for determining effective opening size of testing sieves has been developed by V. R. Deitz and F. G. Carpenter, National Bureau of Standards, Washington. It employs calibrated glass spheres of graduated size, and may be applied by anyone familiar with sieving procedures without need of special apparatus. Glass beads of the type used for highway markings have been found a suitable source of glass spheres from 80 to 1000 microns in diam (U. S. sieves No. 170 through 18). Limited number of calibrated glass-sphere mixtures are available at $10 each from J. M. Brown, secretary, Bone Char Research Project, c/o Revere Sugar Refinery, 333 Medford St., Charlestown 29, Mass.



This maze of tubes and gages constitutes a vacuum fusion apparatus for determining the quantity of gases in metals and alloys. Unit was built at Armour Research Foundation of Illinois Institute of Technology, Chicago, and Joseph McAndrew, associate metallurgist, is the operator

Production News

DO IT MECHANICALLY...NOW!

SAYS ONE OF THE NATION'S INDUSTRIAL AUTHORITIES..

Increased productivity" is the keynote of the day. Conveyors can help toward ... ment operating at capacity (b) deliver ... king height (c) material ... ing the above s...

If you have a handling problem Conveyors

Logan Roller Conveyor facilitates the handling of green sand cores from bench positions on each side of conveyor to continuous core oven in this steel foundry. Cores do not ride directly on the rolls, but are placed on pallets for convenient handling to and from conveyor and in loading core oven.

"Manpower will be too scarce in the months ahead to waste it on jobs that can be done mechanically. Moving of materials is a type of work that can be almost completely mechanized. It must be mechanized NOW."

. . . so speaks one of the nation's industrial authorities. In line with the above, Logan Conveyors free employees for productive activity because Logan Conveyors (a) deliver molds and castings to operators at convenient working height (b) keep molding and machining equipment operating at capacity (c) save time and effort between processes.

Two generations of conveyor experience are back of every Logan installation. Write for literature, or for engineer to call.

Logan Conveyors

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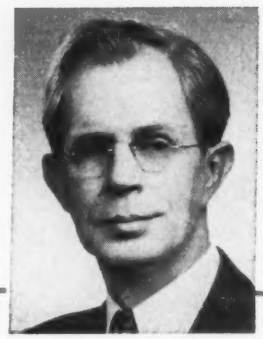
LOGAN CO., 580 CABEL ST., LOUISVILLE, KY.

MAN-TO-MAN

on the Molder's Bench

"Local Goings On"



By RALPH L. LEE

ONE of the things we get quite a bang out of up in the Lee Hobby Foundry is hearing the comments of old timers who have spent most of their lives in certain departments of larger foundries. When they see the whole operation being carried on by one individual, from making the patterns clear on through to cleaning the castings, I gather from what they say that they have never realized before how much they have been leaning upon others—also how much more they would have to remember and do if they were working by themselves.

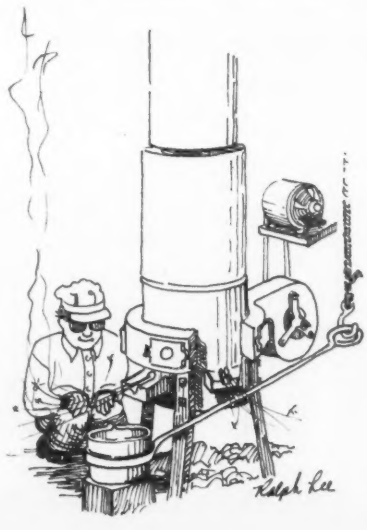
Once in a while one of these visitors rolls up his sleeves to take a hand, and while some get along pretty well, others find themselves rustier than they realized. I wouldn't for the world even hint at such a thing, but the truth is they slow me up instead of helping.

Quite a few (aged in the wood) foundrymen remark, as they see me going about my work, what a wonderful thing it must be to have my free rein to do as I derned please, with no boss giving me orders I must carry out even though I don't quite see eye to eye with him. Or, just to keep peace in the family, having to do certain things I would rather not do.

I usually agree with them—while thinking that no two-legged boss wearing pants could possibly be as domineering, exacting and picayunish a boss as the casting process itself. Which reminds me of a great big glowering eye of the Creator pictured in my grandmother's Bible; when I was a little kid she explained this eye was to see everything I did, even when I was hiding 'way back in some dark closet, even the thoughts in my mind, so I'd better watch my step.

I've often thought that if there is a god of the foundry (Vulcan) he probably is as demanding, exacting and observing as the one behind the eye in grandma's Bible, for in the one-man foundry at the shakeout judgment day I find I can't get by with anything and am held to strict account for every tiny little sin of omission and commission.

This, of course, brings out one of the outstanding disadvantages of being as free as the air in a one-man foundry. When things go wrong you can't call a meeting and lay down the law to somebody who is suspected of being asleep at the switch. The only thing you can do is to go out behind the barn and kick yourself in the stern—which leaves mine black and blue most of the time. I have the feeling that it would be good for almost any foundryman to do a turn in the Lee Hobby Foundry, working all by himself and doing everything that has to be done. Maybe you might like to pretend that it was you the other week end, instead of Ralph Lee, turning out 25 little gray iron castings.



I had made the pattern plate (plywood) with runners and gates, even the sprue, all shellacked up, smooth and nice, with the fittings for the pins; so now I had to do a little planning. You see, I hadn't used the cupola for quite some time, and the ladle had to be lined. Then too, after hearing a guy shoot off at one of the regional foundry conferences on cupola operation, I made up my mind that all of the fines messed up in the coke I had been using were probably responsible for the cold iron I'd had. So I figured that I would screen every derned bit I used this time.

Then I had to get my sand heap in shape—you can imagine how it dries out between these trips I am forever making. I realized, of course, that I couldn't do everything at once, so I had to get things lined up so that first things would be done first and so forth.

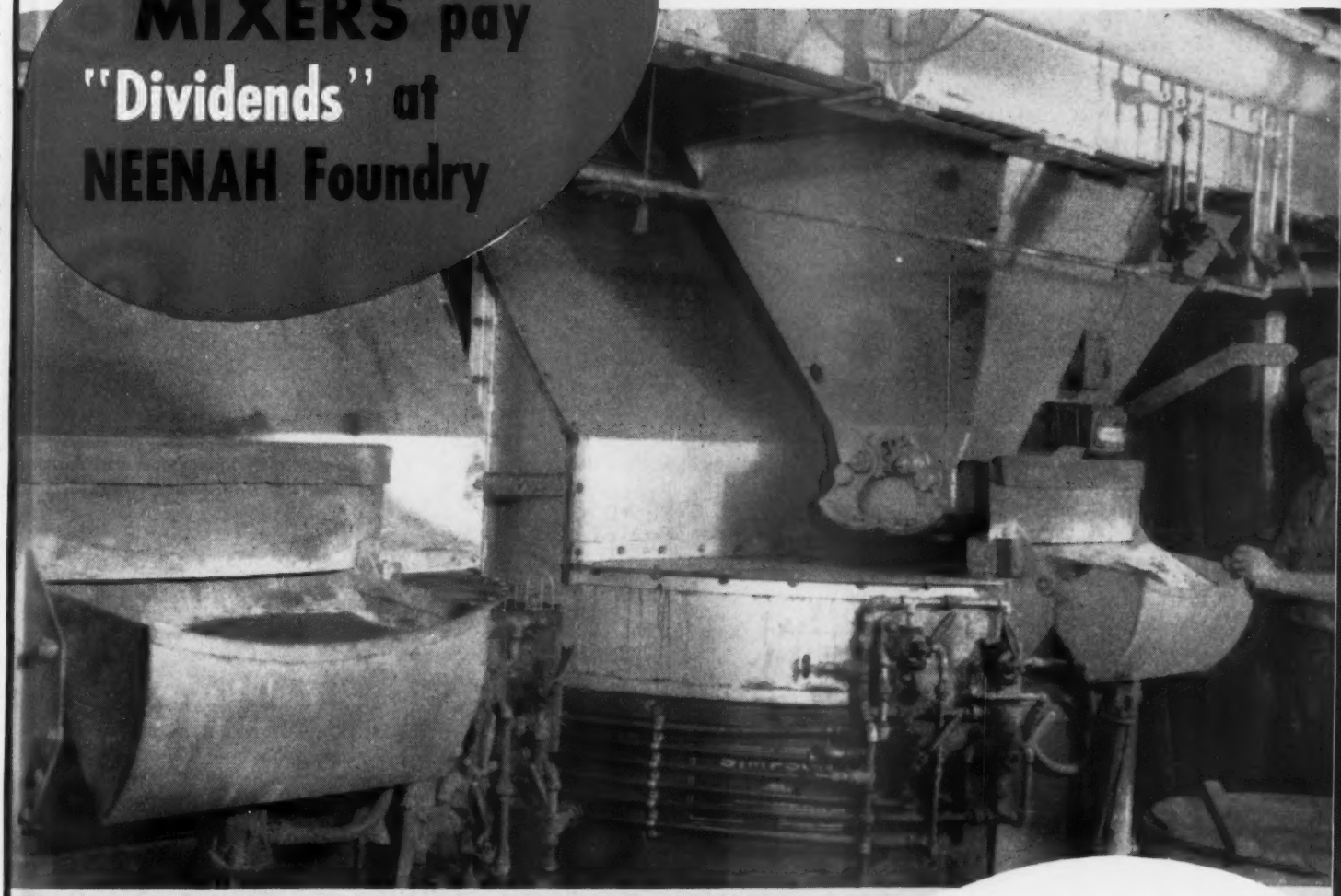
This fellow at the conference bore down pretty heavy on the trouble you can, and frequently do, get into with green ladle linings, and how moisture has a sneaking habit of hiding itself even in ladle linings that are red hot, so I thought I had better forget everything else and get the ladle in shape.

By the way, there was something I'd been wanting to try for a long time (I had experimented a bit). I made a mixture of water, one of the new wetting agents and a little bit of oil to wet down three parts of molding sand and one part fire clay. The oil idea came to me from the old pottery where I used to hang around as a kid; in fact, I worked the lining material just as though I was going to make a pot. I dried the lining in the core oven at about 100° F overnight, gave her the works (350°) the next day and brought her up to almost white heat before I poured. You know, there wasn't one hair crack and the iron drained out to the last drop. I'll betcha that oil (machine oil by the way) had something to do with my good luck.

The sand heap was pretty dry, so I wet her down to that exact point where we feel that that's about it, approximately or is it? This trick is very hard to explain to a beginner. I intended to run a moisture test after the riddling and mulling but there was so much to do that I didn't quite get around to it. The sand felt pretty good though, although I think it might have been a wee bit on the wet

(*Concluded on page* 152)

SIMPSON MIXERS pay "Dividends" at NEENAH Foundry



THESE two No. 3 Simpson Mixers are the "heart" of the modern sand preparing plant at the Neenah Foundry, Neenah, Wisconsin. They are a vital part of the completely mechanized sand and mold handling system designed and installed for this progressive grey iron foundry by NATIONAL Engineering Company.

Before the Simpson Mixers were installed, it was necessary to rely on two separate sand mixing operations to produce both facing and backing sand.

After inspecting typical Simpson Mixer installations in other foundries, Neenah chose two No. 3 Simpsons, which eliminated the need for separate mixing operations.

In addition, the high quality sand prepared in the Simpson Mixers has resulted in greatly improved casting quality . . . together with appreciable savings in raw materials, time and production cost.

If *you're* looking for increased production with improved product quality, get the *facts* about SIMPSON High-Capacity Mixers. Write for details, or ask for a copy of our 8-page booklet *"The Heart of any Sand Preparing System"*.

. . . HERE ARE THE RESULTS OBTAINED AFTER INSTALLING TWO No. 3 SIMPSON MIXERS:

- ★ IMPROVED QUALITY OF CASTINGS
- ★ ELIMINATED NEED FOR TWO MIXING OPERATIONS ON BACKING AND FACING SANDS
- ★ SCRAP DUE TO SAND REDUCED 50%
- ★ 75% REDUCTION IN AMOUNT OF NEW SAND AND BOND REQUIRED

SEE PAGE 154 FOR MORE DATA

SIMPSON MIXERS

NATIONAL *Engineering Company*

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Manufacturers and Selling Agents: For Continental European Countries—George Fisher, Ltd., Schaffhausen, Switzerland; for British Possessions—August's Limited, Halifax, England; for Canada—Dominion Engineering Co., Ltd., Montreal; for Australia and New Zealand—Gibson, Battle & Co., Pty., Ltd., Sydney; for Argentina, Brazil and Uruguay—Equipamentos Industriais EISA Ltda., Sao Paulo, Brazil; for Mexico—CASCO, S. De R.L., Mexico, D.F.

(*Concluded from page* 150)

side. I'm going to test it the next time.

I found that the cupola lining was in pretty good shape, much better than I thought it would be, so it wasn't much of a chore to patch her up. As I went about this job I kept hearing that dude I heard at the conference, talking about the bellying out in the melting zone and how foolish he thought it was to patch her up straight each time, so I thought I'd give his idea a try. I even put a slight suggestion of the eyebrows he suggested, over each tuyere. The spout and the breast were in good shape too. I did have to touch up the slag hole a bit, not much though.

This cupola fellow at the conference must have made a big impression on me, for I made up my mind that on this heat I was going to burn in that old coke bed as it should be burned in. I took particular care with the sand bottom, not too wet and not too dry, with just the right slope. I use the same motor for my Goldberg sand conditioner as I do for the blower, so I moved it over, oiled up the blower and put on the belt. Just to see that everything was in working order I thought I'd throw on the switch for a minute, and you should have seen the shavings, straw and paper fly out of the tuyeres; a family of field mice had built their nest in the wind box. What a day!

As usual I had to remove a number of negative drafts I found on the pattern during the first tryout (why, oh why, can't I learn?). But I don't know when the molding operation ever went more smoothly—the Goldberg molding machine of mine surely made its pappy happy the way it performed. Hot ziggety!

Well, if you can just picture the molds all out on the floor, all lined up. By the way, getting along in years as I most surely am, I've made me a two-pronged hook with a handle at the top so I can slip it under the mold board and carry the mold on out and set it down just as though it was a bucket of water. Don't have to stoop. And why not? Anyway it works like a charm, for me at least.

Got to sift my coke, and I had made a special riddle just for the purpose, but hadn't been using it. It took that conference fellow to get me on the straight and narrow. It didn't take any time at all. Now to make up the charges.

This time I decided to double up the charges—that is, to make each one twice as big as I had been in the habit of doing. If it worked it would save a lot of time at the spot when I didn't have any to spare.

I lighted the paper and kindling and I must have put too much coke on top, for the smoke came out in the foundry in clouds; in fact, it chased me out of the building. The next time I'm not going to put on so much coke, or pack the paper so tightly the flame can't get through.

I let the bed burn in good while I was making the molds, turned on the blast a bit for good measure and leveled off the bed. I can do this in a pewee cupola the size of mine without singeing my whiskers, although I've got to be careful. Limestone on the bed, plenty of it this time, then the charges (forgot the soda ash, darn it). We're drawing near the time now. Came near forgetting the hook to hold the ladle handle for me while I tap, also the ferrosilicon.

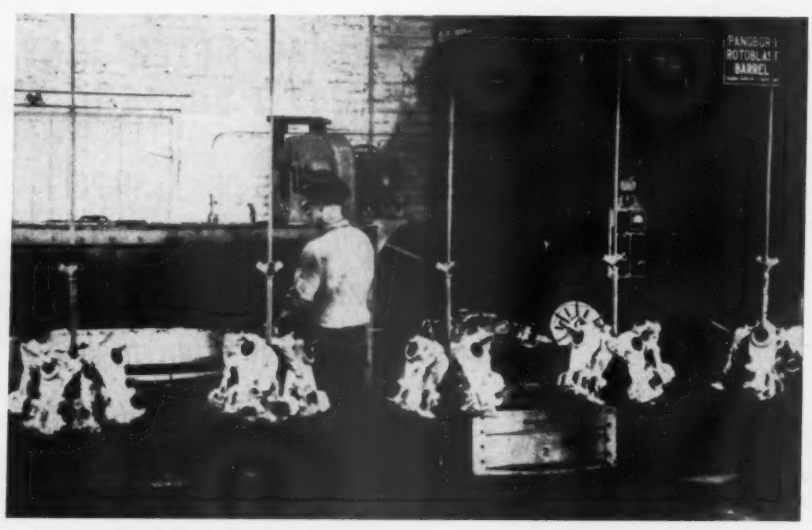
Now my leather spats, my goggles, my log book, alarm clock up on the shelf. "All set?" I ask myself, then nod my head to myself and on goes the blast. The tap hole and, of course, the slag hole are open. The ladle is good and hot. I peep into the tuyere door windows and she's dripping down in fine shape, a dribble of iron comes out of the spout, so I bot her up. It won't be long now. Some more looks through the glass, slag is beginning to ooze out of its hole; this means that most of the iron is down. Then the house phone rings—it's Mother, the home superintendent (vice president in charge). "Daddy, we're all waiting for you to come to supper." "Mamma," I say, "If Harry Truman was down there waiting with you I couldn't come. Go ahead and eat, I'll be down as soon as I can; *goodbye* mother."

With the ladle in place, the handle held up by its hook, I poke the old tapping bar into the bot and whooie, out she comes, good and hot, liquid as water, spluttering, sizzling and sparkin'. I bot her off, dump in the ferrosilicon, skim off the little slag—boy that ladle's heavy and hot. Miss the hole on some of the molds but no runouts this time.

Now I drop the bottom—and it's a clean drop—ply the sprinkling can, clouds of steam spurt. And then I sit down!

I can't wait till after supper so I shake out just one mold; and it dawns on me that I left off the gates on one side of each pattern. I had planned to have two. Woe is me! Will I ever learn? But thank the Lord the metal was hot enough to fill the molds anyway—although I must add the other gates, as I had some cold shuts.

That's the way it goes up in the one-man foundry. It sure does teach you respect for all the laws of the game and for the many fine guys who are in it. I think that maybe my experience in the one-man organization helps me appreciate the advantage of working in a larger outfit where there would be somebody to keep me from forgetting all of the things which must be remembered.



CLEANING ROOM: Straight-line layout of the cleaning room at Fairbanks, Morse & Co., Freeport Works, Freeport, Ill., is said to enable one man to clean 2500 ten-lb castings in an 8-hr day. Room is equipped with a 14-ft rotary blast rocker-barrel and a 9-ft rotary blast table. An overhead conveyor system brings castings from shakeout to cleaning station. Conveyor hooks have four-way fittings into which short lengths of pipe may be slipped to permit as many as 16 pump body castings to be carried on each hook. Castings range in size from 2 oz to 120 lb, and average 10 lb each. Photo by Pangborn Corp., Hagerstown, Md.

LARGE CAPACITY...

HIGH PRODUCTION

DEMMLER

"E" SERIES CORE BLOWERS

are real money makers!

Readily adaptable to a wide range of core making requirements, Demmler "E" Series core blowing machines combine large capacity with high rate of production.

THIS MEANS PROFIT FOR YOU!

Demmler "E" Series core blowing machines have a number of outstanding features that place them way out front.

Strong, structural steel frames rigidly support the machines and allow for varying heights as required for the core box and draw. The draw cylinder has a long center guide stem that slides in a sleeve, assuring an extremely accurate draw. Table height is adjustable so that only the required amount of draw need be used.

The standard machine is operated by two hand valves. One of these moves the carriage from filling to blowing position. The other raises the table, clamps the core box, blows and then draws the core.

A semi-automatic control valve, with which these machines may be equipped, is also available. One movement of the valve lever puts the machine through one complete cycle of operations.

This method of operation is ideal when duplicate drag half core boxes are used, since the operator can remove one core from the box and prepare the box for blowing while the machine is going through the cycle of blowing another core.

These machines are made in four sizes to meet the requirements of every kind of production core work.

WRITE TODAY FOR COMPLETE SPECIFICATIONS

WM. DEMMLER & BROS., KEWANEE, ILLINOIS

speed plus dependability

DOES MECHANIZATION PAY OFF?

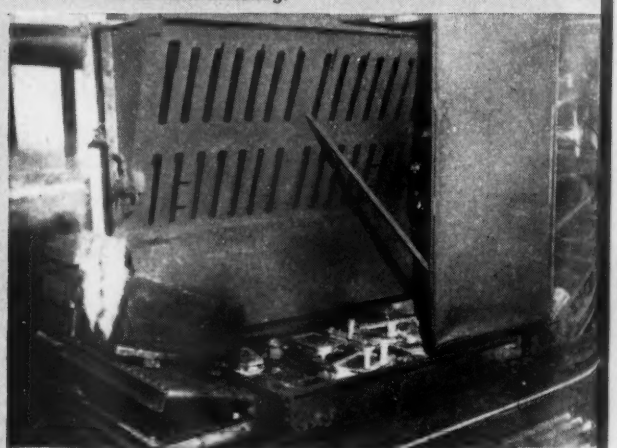
. . . ask NEENAH FOUNDRY COMPANY!

Complete NATIONAL Sand and Mold Handling System Doubled Production in HALF the Floor Space

BEFORE Medium size molding station before mechanization. Notice wasted floor space and handling required for floor-heaped sand.

AFTER Medium size molding station *after* National mechanization showing compact grouping of molders stations with overhead hoppers and air operated doors.

BEFORE Castings awaiting delivery to cleaning room. Note wasted floor space and need for manual handling.



AFTER Automatic transfer of castings from vibrating shakeout to apron conveyor.

IT takes modern, high-capacity equipment and methods to keep pace with today's production demands. That's why Neenah Foundry Co., large midwest producer of grey iron castings, installed a complete National Sand and Mold Handling System. Simpson Mixers—Shakeouts—Belt Conveyors—Hoppers—Storage Bins and Feeders are included in this *mechanized* approach to a basic foundry production problem.

And what has this mechanization meant to Neenah? Production of small and medium size molds was *doubled* within six months . . . yet the National Mechanized Sand and Mold Handling Equipment occupies only *one-half* of the space formerly used for the same operations . . . while working conditions were made safer, more pleasant and more efficient.

Why not realize similar production advantages and savings? Let experienced National Engineers help you design and equip your foundry. Write for more details today.

SEE PAGE 151 FOR MORE DATA

SIMPSON MIXERS

NATIONAL *Engineering Company*

608 Machinery Hall Bldg. • Chicago 6, Illinois

Manufacturers and Selling Agents: For Continental European Countries—George Fisher, Ltd., Schaffhausen, Switzerland; for British Possessions—August's Limited, Halifax, England; for Canada—Dominion Engineering Co., Ltd., Montreal; for Australia and New Zealand—Gibson, Battle & Co., Pty., Ltd., Sydney; for Argentina, Brazil and Uruguay—Equipamentos Industriais EISA Ltda., Sao Paulo, Brazil; for Mexico—CASCO, S. De R.L., Mexico, D.F.

Activities of Foundry

GROUPS

Western New York

MAGIC and Safety" was the title of the talk presented by Lt. Thomas M. Brown of the Erie Railroad Police, Cleveland System, at the Feb. 2 meeting of Western New York Chapter of the AFS, Hotel Sheraton, Buffalo.

Although the primary work of the railroad police is claims investigation, safety has become one of their major tasks. A demonstration of magic which included references to accident prevention, was given by Lieutenant Brown.

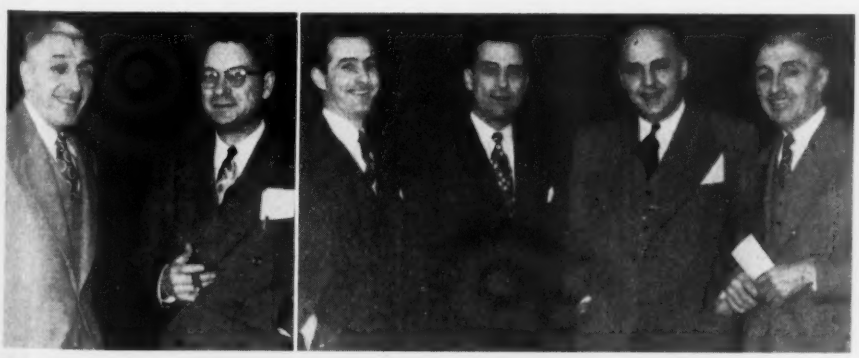
A roundtable discussion led by Rudolph Wilke, chief metallurgist, American Radiator & Standard Sanitary Corp., followed. It was pointed out that sulphur as low as 0.025 is considered normal in a basic-lined cupola. Many of the problems of blowing refractory materials and lining cupolas were considered. It was learned that several foundries are having trouble with patches breaking away, but the refractory producers hope that within a short time this condition will be corrected by improved material.

Seven Danish foundrymen visiting this country through the Economic Co-Operation Administration, were guests of the chapter at the Mar. 2 meeting. William W. Maloney, secretary-treasurer of AFS, was present at the meeting and outlined the program for the convention to be held in Buffalo Apr. 23-26.

John Caine, foundry consultant, Cincinnati, was the technical speaker and his talk covered "Gates and Risers." Referring to gates, Mr. Caine presented principles and formulas of hydraulics and pointed out that the difficulty in using these principles involves the human element. Such difficulties as soft ramming, mixed matchplates and old gate sticks always cause crushes and tear-ups in the mold.

Erosion in the gates is the primary reason for sand in the casting. Until ramming is improved and discontinuous flow of metal over a flat surface is eliminated, foundrymen cannot hope to improve their castings. He suggested tilting the mold to improve the flow of metal, but Mr. Caine recognizes this is difficult and almost impossible in a production plant.

Another point raised was that the riser sections must be larger than casting sections unless exothermic material is used. An incorrect riser contact with the casting is an outstanding cause of rejection where shrinkage is involved. Joseph Sander, Tonawanda Electric Steel Casting Corp., was technical chairman and Alfred A. Diebold, Atlas Steel Casting Corp., and chapter chairman, presided.—*Marve Taublieb, Frederic B. Stevens Inc.*



WESTERN NEW YORK Chapter of the AFS met at Hotel Sheraton, Buffalo, Feb. 2, to hear two speakers. Shown above, left to right, are: Roger Walsh, Hickman, Williams & Co.; Rudolph Wilke, American Radiator & Standard Sanitary Corp., one of the speakers; Lt. William C. Hart and Lt. Thomas M. Brown (chief speaker), Erie Railroad police; Erwin Deutschlander, Worthington Pump & Machinery Corp., and Mr. Walsh. Photos were furnished through the courtesy of Marve Taublieb, Frederic B. Stevens Inc.

Central New York

MARCH meeting of Central New York Chapter of the AFS was held at the Onondaga Hotel, Syracuse, N. Y., with 110 members and guests present. S. C. Massari, technical director of AFS, presented the film "Fluid Flow in Transparent Molds."

Mr. Massari first presented a brief resume of the Research Committee's activities to date, stating that the film was the second progress report on a research project initiated and sponsored by the Aluminum and Magnesium Division of AFS with the assistance from Battelle Memorial Institute.

The film, in color with sound pickup, and Mr. Massari as narrator, illustrated the results of the work conducted between October, 1947 and June, 1950. It showed the development of the pouring box, sprue and horizontal runner and gate systems, using transparent plastic molds and water.

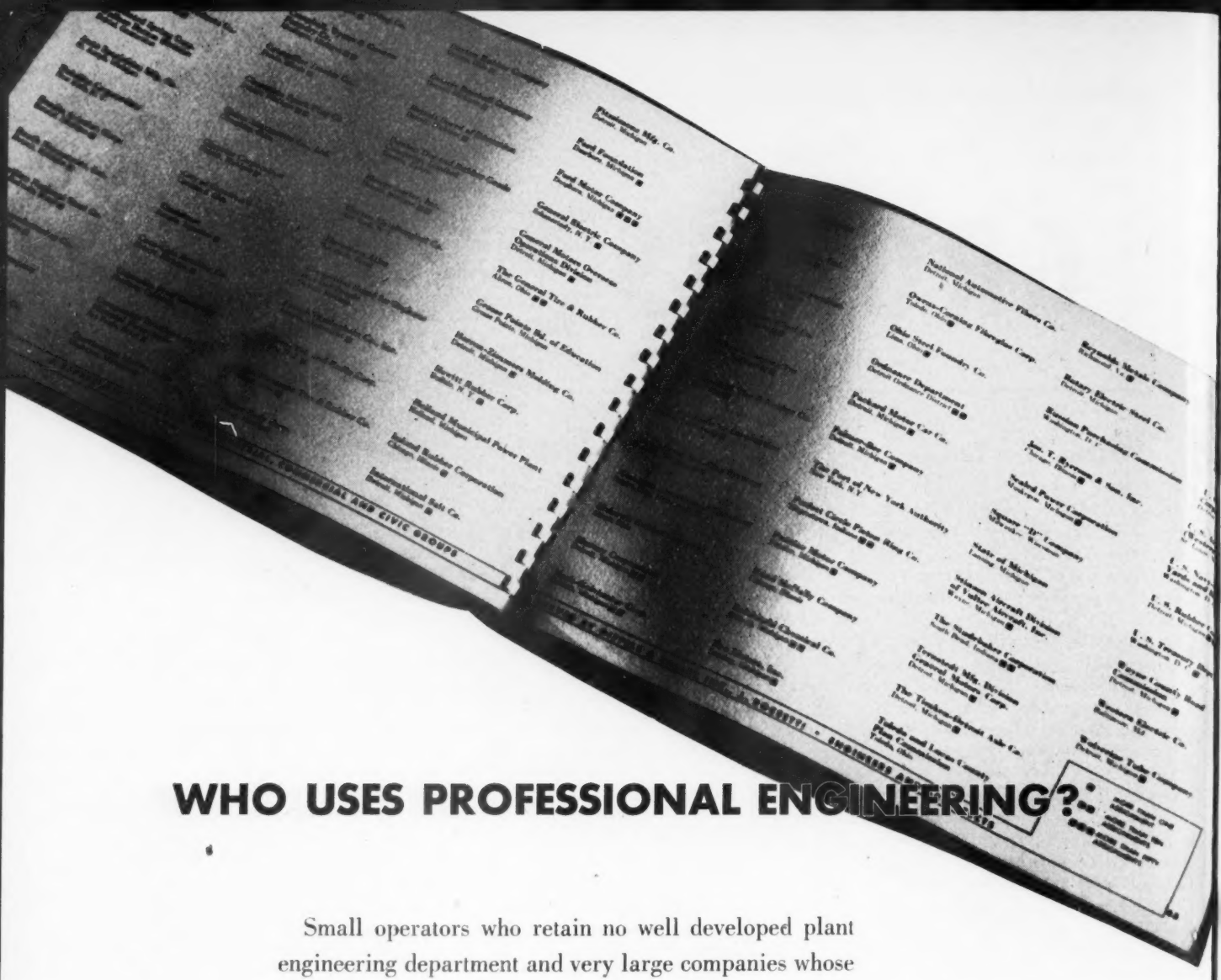
It also demonstrated that to obtain sound castings the gating system should be so designed that it can be filled quickly and before any metal enters the mold cavity. To date the research has indicated the advisability of placing the runner in the drag and the gates and mold cavity in the cope. All work to date has been done with flat, low height castings.—*James W. Ogden, Cleveland Tramrail Syracuse Co.*

New England

EIGHTY members and guests of the New England Foundrymen's Association attended the Mar. 14 meeting at the Engineers Club, Boston. After dinner, Wallace G. Strathern, director of training for Eastern Gas & Fuel Associates, Boston, presented an inspiring illustrated outline, "It's Time To Sell the American Free Enterprise System." Eastern Gas & Fuel Associates as well as other companies are firm in their belief that one sure way to defeat the isms threatening our democracy is to have employees, supervision and citizenry, both young and old, well informed in the principles of the American free enterprise system.

The following have been elected officers for 1951: President, Robert E.

(*Continued on page* 157)



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INDUSTRIAL ENGINEERING DIVISION
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(*Continued from page* 155)

Walker, Whitin Machine Co., Whitinsville, Mass.; vice president, Frank R. Elliot, Westinghouse Electric Corp., Springfield, Mass.; treasurer, Arthur W. Gibby, retired; secretary, Ernest F. Stockwell, Barbour-Stockwell Co., Cambridge, Mass. Executive committee members are: Joseph B. Stazinski, General Electric Co., Lynn, Mass.; Gordon L. Paul, Brown & Sharpe Mfg. Co., Providence, R. I.; Henry G. Stenberg, Draper Corp., Hopedale, Mass.; Harry E. Gibby Jr., Mechanics Iron Foundry Co., Boston; John A. Curtin, Waltham Foundry, Waltham, Mass.; Albert M. Nutter, E. L. Le Baron Foundry Co., Brockton, Mass.; and Charles A. Reed, retired.

Philadelphia

THE Feb. 9 meeting of Philadelphia Chapter of the AFS had as an honored guest Fred G. Sefing, International Nickel Co., New York, and a national director of the AFS. He spoke briefly on the activities of the society. Preceding him was William Pollock, a member of the Philadelphia Charter Committee, who gave an interesting talk on that group's program which centers around youth training for better citizens.

Technical speaker of the meeting was Michael Bock, representative of Exomet Co., Conneaut, O., who discussed and illustrated with slides the use of insulating and exothermic materials in modern foundry practice. Technical chairman was Arthur Thum, president of Palmyra Iron Foundry.—*G. H. Bradshaw, Philadelphia Navy Yard*

Twin City

AT the Mar. 13 meeting of Twin City Chapter of the AFS, more than 50 members and guests heard John J. Stobie Jr., Apex Smelting Co., Chicago, discuss "Modern Quality Control in Aluminum Foundries."

Setting up quality control is not enough, according to the speaker. Vigilance on the part of all foundry personnel coupled with rigid adherence to rules without any deviation is of the utmost importance. The starting point for control is the metal itself. Absolute knowledge of metal analysis is imperative at all times. Aluminum alloys must be chosen for the majority of their beneficial characteristics since no one alloy will satisfy all requirements.

Mr. Stobie pointed out that alloys cannot be changed indiscriminately without regard to gating, risering and feeding systems since flowability differs from one composition to another. He also stressed the necessity for using clean solid scrap. If borings and turnings are to be melted, they should first be pigged and then analyzed.

Fluxing of molten aluminum either with the gaseous or solid types is most important. If a liquid flux is used, small amounts should be stirred in and the surface of the melt watched carefully. As soon as the dry powder ceases to form, the fluxing is adequate. Some fluxing methods tend to coarsen the grain of the metal, therefore titanium, boron, zirconium and sometimes sodium are used to coun-

NATIONAL FOUNDRY ASSOCIATION held a regional dinner meeting Feb. 2 at Mark Twain Hotel, Elmira, N. Y. Fred A. Hartley, former New Jersey congressman and now Washington representative of the NFA, spoke on problems confronting the foundry industry as a result of the increase in our national defense program. L. E. Roark, NFA executive vice president, discussed foundry manpower and raw materials problems. At the center of the table in the photograph above is R. C. S. Potter, Chemung Foundry Corp., Elmira, meeting chairman. Mr. Roark is at his right, and Mr. Hartley is at his left

PHILADELPHIA Chapter of the AFS was host to three speakers at its meeting Feb. 9. At upper left is William Pollock, Philadelphia Charter Committee. Arthur Thum, Palmyra Foundry Co., Palmyra, N. J., upper right, introduced Mike Bock, Exomet Co., principal speaker at the meeting. At lower right is Fred Sefing, International Nickel Co., New York, and national AFS director

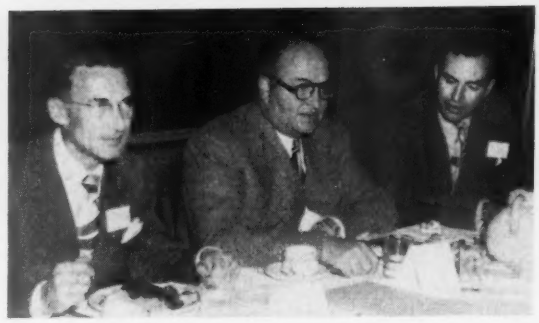
teract this effect. Sodium is especially desirable in high-silicon alloys.

The speaker emphasized the need for temperature control on the melting floor with special attention to keeping the melt at as low a temperature as possible. Small capacity melting equipment tends to "overshoot" more rapidly than larger units. In conclusion, Mr. Stobie discussed the necessity for good housekeeping. This not only makes the foundry a good place in which to work but also aids immeasurably in fostering quality control.—*O. J. Myers, Archer, Daniels-Midland Co.*

Southern California

MARCH meeting of Southern California Chapter of AFS was held Mar. 9 at the Rodger Young Auditorium, Los Angeles.

Following a brief business meeting the chapter had J. A. Gitzen, president, Delta Oil Products Co., Milwaukee, as guest speaker. In his talk, "The Proper Use of Sand Additives," Mr. Gitzen described his experiences during the past 26 years in compiling facts regarding additives.—*S. L. Jackson, Electro Metallurgical Division.*



SOUTHERN CALIFORNIA: Left to right at the chapter's Mar. 9 meeting are: Henry Howell, chapter vice president; J. A. Gitzen, Delta Oil Products Co., speaker, and John Wilson, chapter president. Photo courtesy K. F. Sheckler, Calmo Engineering Co.

Detroit

THE perenially interesting subject "Castings Defects" occupied the attention of Detroit Chapter of the AFS at the meeting held Feb. 15 at Rackham Memorial Building.

On hand to conduct the discussion, show slides of faulty castings and explain what he thought had caused their defects was William A. Hambley, general sales manager, Wilson Foundry & Machine Co., Pontiac, Mich. Mr. Hambley was chairman of the AFS Castings Defects Committee during the time the book, *Analysis of Cast-*

(*Continued on page* 161)

Chicago Chapter Holds Successful Sand Control School

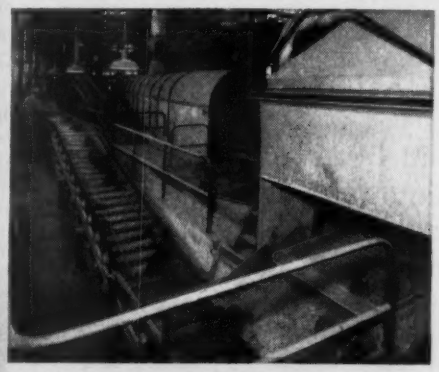
CHICAGO Chapter of the AFS recently sponsored a sand control school at University of Illinois' Navy Pier Division, with 218 attending from 56 companies in the Chicago area. Robert E. Kennedy of the university was chairman of the arrangements committee for the course conducted by F. W. Brewster, sales manager, H. W. Dietert Co., Detroit.

The course covered basic principles of sand control and control equipment, problems of molding and core sands, and of casting defects.

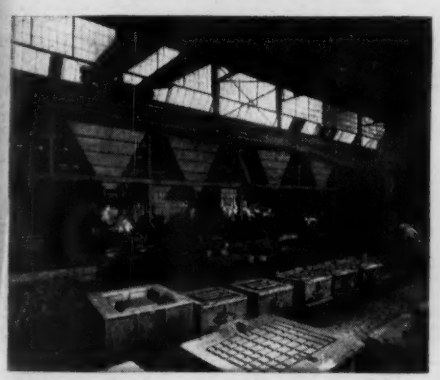
Shown below, left to right, Fig. 1 are: Glenn Cramer, University of Illinois; Tito Tarquinio (hidden), American Manganese Steel Division; Kurt Miericke, Baroid Sales Division, National Lead Co.; Clyde Sanders, American Colloid Co.; K. Jacobson, Griffin Wheel Co., and C. Mathis, Pickands mather & Co. Fig. 2—T. W. Seaton, Beardsley & Piper Division, Pettibone Mulliken Corp.; W. A. Czapla, Pettibone Mulliken Corp.; Fred Kasch, Howard Foundry Co.; Joe Winsky, Pettibone Mulliken Corp.; John Bartus, Pettibone Mulliken Corp.; W. Rom, Beardsley & Piper Division; Robert Thomson, Pettibone Mulliken Corp.; H. L. Campbell, Claude S. Gordon Co., and H. Hermansen, Beardsley & Piper Division.

Fig. 3—Dean F. W. Trezise, University of Illinois. Fig. 4—D. Tierney, Crane Co.; A. Hedberg, E. Dunham, and M. E. Stewart, Wells Mfg. Co.; J. A. Havnen, Liquid Carbonic Corp., and C. Kobus, Crane Co. Fig. 5—C. V. Nass, Beardsley & Piper Division and chapter chairman. Photos are by I. H. Dennen, Beardsley & Piper Division.

Above: Mold Conveyors in Jobbing Foundry Making Large Castings Showing Sand Plant Inside the Loop.



Mold Conveyors, Shakeout, and Castings Cooling and Sorting Conveyor in Low Cost Jobbing Foundry.



Floor Pouring in Jobbing Foundry Making Large Engine Parts Showing Sand Plant and Overhead Sand Return.

Jobbing Foundries

should mechanize too!

● If your work is adapted to molding machines, sand slingers, or a centralized shakeout, it will pay you to mechanize further.

Mechanical handling of shakeout sand; mechanized screening and sand conditioning; overhead sand return; mold conveyors operated intermittently or continuously; and mechanized castings handling, is enabling jobbing foundries — making big castings and small castings — to synchronize their operations, increase production and cut their costs. The C. O. Bartlett & Snow Co., 6201 Harvard Avenue, Cleveland 5, Ohio.

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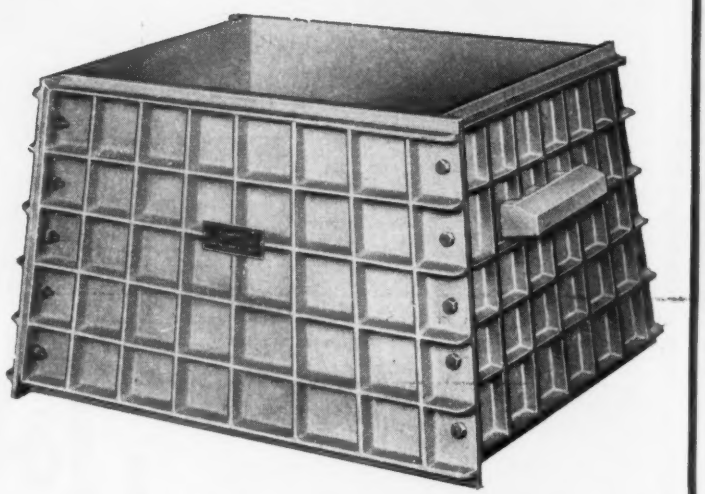
DIAMOND

Aluminum, Grey Iron and Steel Jackets

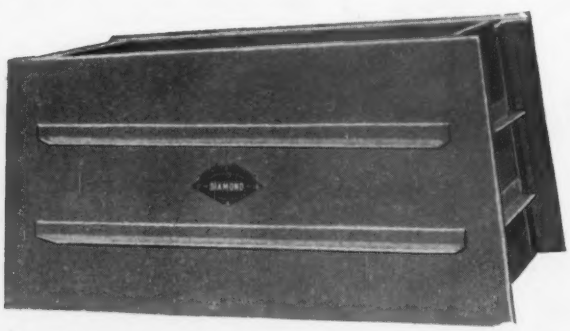
Diamond Flexible Type Jacket. This jacket is ideal in Foundries using Flasks of a variety of degrees in taper. Will fit perfectly any degree of taper from 3° to 6°, supporting the mold on all sides with equal pressure. Will also fit old flasks that are not perfectly square. Jacket made in cast iron or aluminum.



Diamond Solid Type Jacket in Cast Iron or Aluminum. Made in aluminum for foundries desiring a light weight but sturdy jacket for medium weight castings.

Made in cast iron for heavy duty iron and steel castings.

All jackets are assembled on special designed templates in 3°, 4°, 5° tapers and are guaranteed to fit correctly.



This is the widely known DIAMOND Steel Jacket used by foundries since 1908. Thousands are in use today.

DIAMOND

Telephone 2553 CLAMP AND FLASK COMPANY Richmond, Indiana

Designers of* CORE PLATES, JACKETS, BANDS, FLASKS *since 1889

(*Continued from page* 158)

ing Defects was compiled and edited.

An unusual coffee-talk on scientific crime detection, was presented by Inspector Albert Langtry of the Detroit Police Department's scientific laboratory. He pointed out interesting parallels between the investigatory methods used in police work and those used by industry.

Mr. Hambley's approach to the cause of castings' defects was an unusual one. He cited as the cause of scrapped castings the human factor in foundry operations. He believes the most important cause of defective castings is low morale; second most important is lack of integrity. The foundry industry, he contends, is prone to alibi, to try to shift blame for poor work to the materials, to the equipment, to every place but where it belongs, which is ultimately on the shoulders of management.

The correct remedy for all castings defects, he believes, lies in honesty in every phase of foundry operations. It requires recognition of the foreman, and requires that he be competently trained to his job. It also requires that the dignity and importance of each worker be respected. If these things are done, Mr. Hambley asserts, the question is it a "blow" or a "shrink" will not have to be answered nearly as often.—*Howard C. Tuttle*

DETROIT Chapter of the AFS met at Rackham Memorial Building Feb. 15 to hear William A. Hambley, Wilson Foundry & Machine Co., Pontiac, Mich., discuss "Casting Defects." Shown above, examining a defective casting, are, left to right: Ralph Boyd, City Pattern Foundry & Machine Co., Detroit; O. F. Carpenter, Packard Motor Car Co., Detroit, and R. Chris Zanison, City Pattern Foundry & Machine Co. Photo by Walter Ring, University of Detroit

Northwestern Pennsylvania

A VISIT to the plant of United Engineering & Foundry Co.'s steel foundry featured the New Castle meeting of Northwestern Pennsylvania Chapter of the AFS, Mar. 16. After dinner, Harold Johnson, chief metallurgist, National Malleable & Steel Casting Co., Sharon, Pa., presented a talk on "Statistical Control in the Foundry."

Mr. Johnson stated this new tool used in the various National Malleable plants has not only given the company a measuring stick on the quality of material and operations, but has speeded up the flow of materials. After variations are tabulated and standards are set, a check of the quality control charts will show immediately when things are off color and must be corrected. These charts draw a picture of what is being obtained and if kept at the location where used, considerable savings can be effected. One thing necessary, however, is to take action when the off-color variables appear on the charts.

Co-chairmen for the meeting were Mark Baatz, United Engineering and Henry McKinney, Butler Engine Co. The meeting was arranged by Doug-

(*Continued on page* 164)

CHICAGO Chapter of the AFS held its annual Ladies' Night party Feb. 3 at the Palmer House, Chicago, with over 500 attending. View of one of the tables is shown above. Robert M. Jones, United States Steel Co., was party chairman

TODAY'S ANSWER TO SAND MULLING PROBLEM

THE COREMAKER'S ANSWER . . . better—more flowable—non-sticking sand.

THE MOLDER'S ANSWER . . . stronger—more flowable—fluffier—more uniform sand.

THE MAINTENANCE FOREMAN'S ANSWER . . . more sand—less maintenance—no down time.

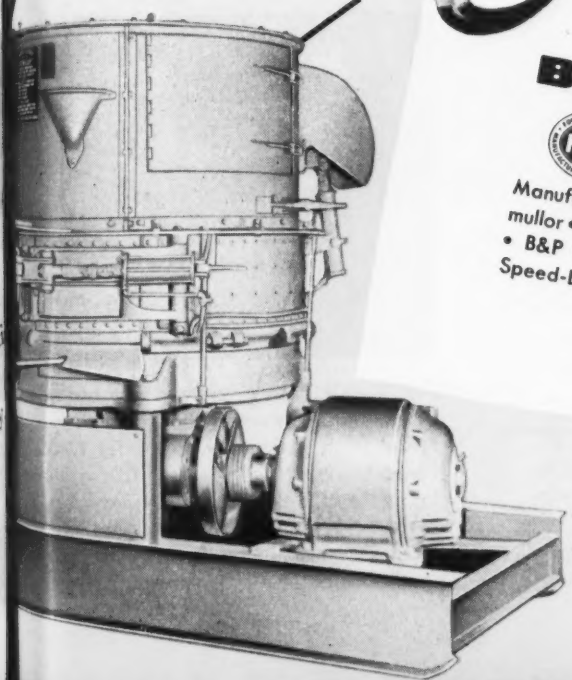
THE SAND TECHNICIAN'S ANSWER . . . more uniform sand of maximum physical properties—minimum material additions.

THE CLEANING ROOM'S ANSWER . . . finer surface finish—easier cleaning.

THE FOUNDRY SUPERINTENDENT'S ANSWER . . . higher uninterrupted production—lowest operating costs.

TOP MANAGEMENT'S ANSWER . . . lowest initi cost—lowest operating and maintenance cost—lowest material cost per ton—and complete dependability

the SPEEDMULLOR



B&P

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Manufacturers of the Sandslinger • Speedslinger • Hydra-Slinger • Speed-mullor • Mulbaro • Screenarator • Nite-Gang • Junior Nite-Gang • Preparator • B&P Combination Sand Conditioning and Mulling Unit • B&P Champion Speed-Draw • B&P Plate Feeder • B&P Turntable • B&P Gyratory Screen

TODAY'S ANSWER to BETTER

MOLD DRAW IN LARGE OR SMALL FOUNDRIES

Mold draw on high production turntable unit using 8 B&P Champion Speed-Draw machines.

Mold draw using 2 portable B&P Champion Speed-Draws with a Tractor Sandslinger.

THE B&P CHAMPION SPEED-DRAW

The B&P Champion Speed-Draw . . . today's answer for those foundries requiring a better mold draw on high production, multi-station Sandslinger-turntable units, or on single station installations . . . assures greater speed with complete accuracy. It's ruggedly built for long service and low maintenance. It's available in 11 models—both stationary and portable. Each model may be used with a wide range of flask sizes. Write today for a Speed-Draw Catalog!

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(*Continued from page* 161)

las James, Cooper-Bessemer Corp., Grove City, Pa., program chairman. Present at the meeting were delegations from Erie, Franklin, Grove City, Meadville, Butler and Sharon, Pa.

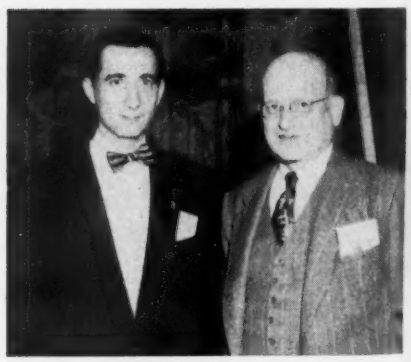
The chapter's regular meeting was held at the Moose Club, Erie, Pa., Mar. 23, with 75 members present. The coffee talk was presented by O. Carlyle Brock, president, Erie Sanitary Dairy Products, Erie, and a well known big game hunter who described a recent trip to Central Africa where he shot elephant, lion, tiger, and rhinoceros.

Technical speaker was Bruce Norris, Allis-Chalmers Mfg. Co., Milwaukee, whose subject was "Modern Aspects of Radiography in the Foundry." Mr. Bruce explained briefly this method of inspection and he believes it will be a great help to foundrymen in producing better castings. He reviewed the history of radiography and the various methods of using radium and cobalt. In his opinion radiographic inspection of all castings is on the horizon for foundries. The new betatron equipment developed recently by Allis-Chalmers is a great advance in this field.

An interesting discussion was led by Ray Zimmerman, chief inspector of General Electric, who, in addition, showed many slides of castings x-rayed by his company.—*Earl Strick, Erie Malleable Iron Co.*

Wisconsin

MARCH meeting of Wisconsin Chapter of the AFS featured the showing of the film, "Fluid Flow in Transparent Molds," produced by Battelle Memorial Institute, Columbus, O., as part of the research project sponsored by the Aluminum and Magnesium Division of the AFS.



METROPOLITAN Chapter of the AFS at its Mar. 5 meeting heard Clyde L. Frear (right), Bureau of Ships, Navy Department, Washington, discuss casting defects. Bernard N. Ames (left), New York Naval Shipyard, was technical chairman. Photo by John Bing, Metropolitan Refractories Corp.

Attention was called by Charles Zahn, chairman of the Old Timers' Committee, that the May 11 meeting will honor old timers and apprentices, an established annual custom. There are now more than 100 foundrymen who have been active in the trade for more than 50 years and the number is still growing. Mr. Zahn urged all members to notify him several weeks in advance of the meeting of foundrymen entitled to receive the plaque, which is engraved with the recipient's name and record in the industry, so they can be invited and their plaques prepared for them. —*John E. Hubel*

Lufkin Foundry Serves Industrial Southwest

(*Continued from page* 93)

ed in handling patterns for short runs. At Lufkin as many as 17 pattern changes may be required daily he main bay on the larger castgs, but an efficient method is employed in transferring patterns from storage to molding machines and ice versa. Patterns are stored in separate building adjacent to the main bay. Larger mounted patterns re racked on pallets which are easily picked up by a fork-lift truck, moved to the foundry and deposited n a gravity roller conveyor leading to the molding machines. Another ller conveyor line receives patterns after use for return by truck to storage.

This handling method is indicated in Fig. 1, which also shows one of

PHILADELPHIA Chapter of the AFS at its Mar. 9 meeting heard Dr. Michail M. Dorizas, Wharton School of Finance and Commerce, University of Pennsylvania, speak on "The Korean Situation." He discussed the European problem as it affects American privileges and responsibilities and told stories of his travels through the Far East, Asia and Europe. Photo by William Mooney, Dodge Steel Co.

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FEMA

the two major molding units. This 13,000-lb capacity jolt-rollover machine produces all of the large molds for the company's products. Only the larger jobbing work is made as a floor job. The two large molding machines are supplied sand from overhead hoppers of 5-ton capacity. These hoppers receive sand via belt conveyor from two mullers. Completed molds are set out on the floor for pouring and are subsequently carried to an 8 x 10 ft shakeout for recovery of the sand and castings. The sand falls through the shakeout and is conveyed by vibrating conveyor, belt conveyor and a bucket elevator to the 300-ton capacity sand storage bins above the sand preparing units. A magnetic separator removes all tramp iron from the sand and a vibrating screen removes all nonmagnetic refuse.

The side bay, where smaller castings are made, has its own separate shakeout, sand system and cupola. The cupola is lined to 36 in. inside diameter and both cast iron and nodular iron are melted for this department. This department has eight molding stations, including two jolt-squeezer machines and three sets of jolt-rollover, pin lift combinations; the rollover machines make the drag and the pin lift machines make the cope half of the molds. All machines are supplied sand from overhead hoppers. An all-synthetic sand is prepared in a 1500-lb capacity mixer and delivered to the molding sand hoppers by belt conveyor.

Molds from the rollover-pin lift machines are placed on conveyor rolls for pouring from 1500-lb capacity ladles handled by an overhead crane system. The squeezer molds are placed on pallets on roller conveyor and are poured from 500-lb capacity ladles with an overhead crane. After pouring, the squeezer molds are dumped into a long metal box (Fig. 6) which is moved by monorail crane and carried to the 4 x 6 ft shakeout and dumped through a hinged door in one end, as shown in Fig. 7.

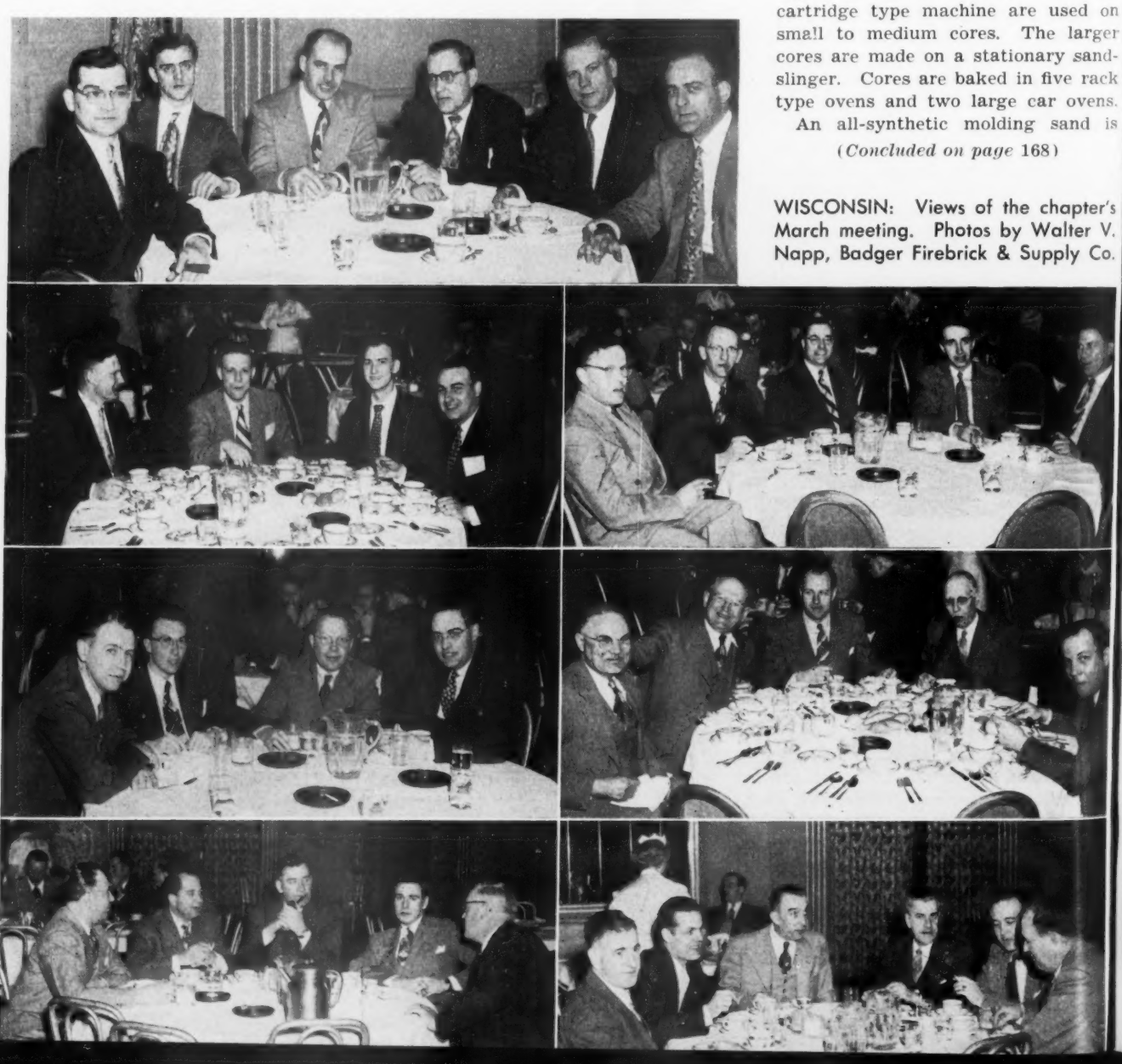
Larger molds are moved to the shakeout on a gasoline-motor powered transfer car, where the molds are rolled off the transfer car onto a set of rolls directly behind the shakeout. There they are picked up by an air hoist on a jib crane and placed on the shakeout. The castings fall off into a metal tote box for delivery by fork truck to the cleaning department, and the empty flasks are placed on pallets to be taken to the flask storage yard. A strong exhaust at the shakeout prevents dispersion of smoke and dust.

Cleaning department facilities include an airless blast barrel, a shot blast room and an airless blast table. Largest castings are cleaned in the shot blast room and are placed on wagons for handling to and from this unit. All large castings are stored on pallets, and the smaller parts are stored in metal tote boxes, to facilitate transfer to the machine shop.

The coreroom occupies a separate extension from the main foundry bay and employs a variety of equipment. In addition to eight coremaking benches, two blowers and one cartridge type machine are used on small to medium cores. The larger cores are made on a stationary sand-slinger. Cores are baked in five rack type ovens and two large car ovens.

An all-synthetic molding sand is

(*Concluded on page* 168)



WISCONSIN: Views of the chapter's March meeting. Photos by Walter V. Napp, Badger Firebrick & Supply Co.

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(*Concluded from page* 166)

furnished by two mullers in the main bay. Sand is moved by conveyor belt to molding station hoppers. Frequent checks are made of molding sand mixtures, and moisture of 7 per cent is maintained in the main bay and 4 to 5 per cent in the side bay. Both molding and core sands are southern grades of 40 to 75 AFS grain fineness.

Careful control likewise is maintained over the metal. Physical tests are made regularly and drillings are analyzed for chemical composition. A well equipped metallurgical department includes x-ray equipment as well as physical testing facilities. A 220,000-volt x-ray machine is used for routine examination of castings and for inspection when new castings are put into production.

The chemical laboratory is in the nature of a routine check and control department. Ten to fifteen samples of iron are sent to the physical test laboratory daily in the form of standard arbitration bars. These are tested for transverse strength and deflection in a hydraulic testing machine. From the broken arbitration bars, tensile specimens are machined and pulled for ultimate strength.

Some of the more complicated cast parts, including engine castings, are heat treated to relieve internal stresses. This annealing treatment usually consists of heating at 900° F for one hour per inch metal thickness.

Five basic grades of iron commonly are produced. These range in tensile strength up to 60,000 psi. Since the company machines a large portion of the castings it produces, it has a constant check on the soundness of its products. Close co-operation between the foundry and engineering departments permits the most efficient practices in the design of the castings.

Any discussion of Lufkin Foundry & Machine Co. would be incomplete without mentioning the part played by the late Walter Charles Trout in guiding the company's affairs for more than 40 years. At one time associated with the saw mill department of Allis-Chalmers Mfg. Co., Milwaukee, Mr. Trout in 1905 went to Texas and acquired an interest in the Lufkin company. It was then a small organization employing about 35 persons; its subsequent development in plant size and in range and volume of products is a tribute to its management during the intervening years. Mr. Trout was president and active head of the company at the time of his death four years ago. Two of his sons carry on in executive capacities, Walter W. Trout as president and Edward P. Trout as vice president.

Olivine Sand Research

(*Continued from page* 105)

Washington, in the Cascade mountains and in some of the San Juan islands. This fact prompted the University of Washington to sponsor an investigation of the utility of Washington olivine as a foundry sand. The development could have far-reaching results in the event of a national emergency since it would place a foundry sand aggregate close to West coast industry.

There is precedence for the use of olivine foundry sands. Private correspondence with three steel foundries in Norway indicates they are operating successfully with olivine molding sand. Other examples have been described in technical literature published in Europe and America.

Following a decision to investigate this material in some detail all molding sand, natural and synthetic, was removed from the University of Washington foundry laboratories last summer. Since the opening of the school term in late September, 1950, an olivine-base synthetic sand has become the standard molding material for all operations, ferrous and nonferrous.

The high fusion point, combined with low uniform rate of thermal expansion, indicate that olivine would be most satisfactory for steel and heavy iron castings. Its apparent hygienic advantages suggested its utility for light iron and nonferrous castings.

In addition to excellent refractory and physical properties, extensive medical tests have indicated that olivine dust will not cause silicosis. This property has been a leading factor in olivine adoption by Norwegian foundrymen. This hygienic characteristic of olivine seems worthy of emphasis.

Laboratory tests of various sand mixtures were followed by trial castings. Enough information was developed to operate the foundry at the opening of the academic year entirely without confusion and certainly without inferior results. Most commercial operations can be duplicated in the foundry. It provides pilot plant operation for our research projects. Introduction of olivine sand has in no way impaired the value of the foundry instruction program.

Extensive Research Program

Paralleling the instruction program of engineering studies, an intensive research project on olivine sands is being conducted by A. L. Nelson, a graduate fellow in the University of Washington Engineering Experiment Station. When completed, his researches will form the basis of rather complete knowledge of olivine foundry sands.

Olivine was obtained from the Twin Sisters mountain area in the Cascades, located about 90 miles northeast of Seattle. The rock was prepared by roll-crushing and screening. The fines were removed by air classifying to give the desired grain distribution. The sand has an angular grain approaching a cube shape with very few slivers of long grains.

It was necessary to thoroughly remove all foundry sands prior to the introduction of olivine because silica contamination lowers the fusion point of olivine. As the material was

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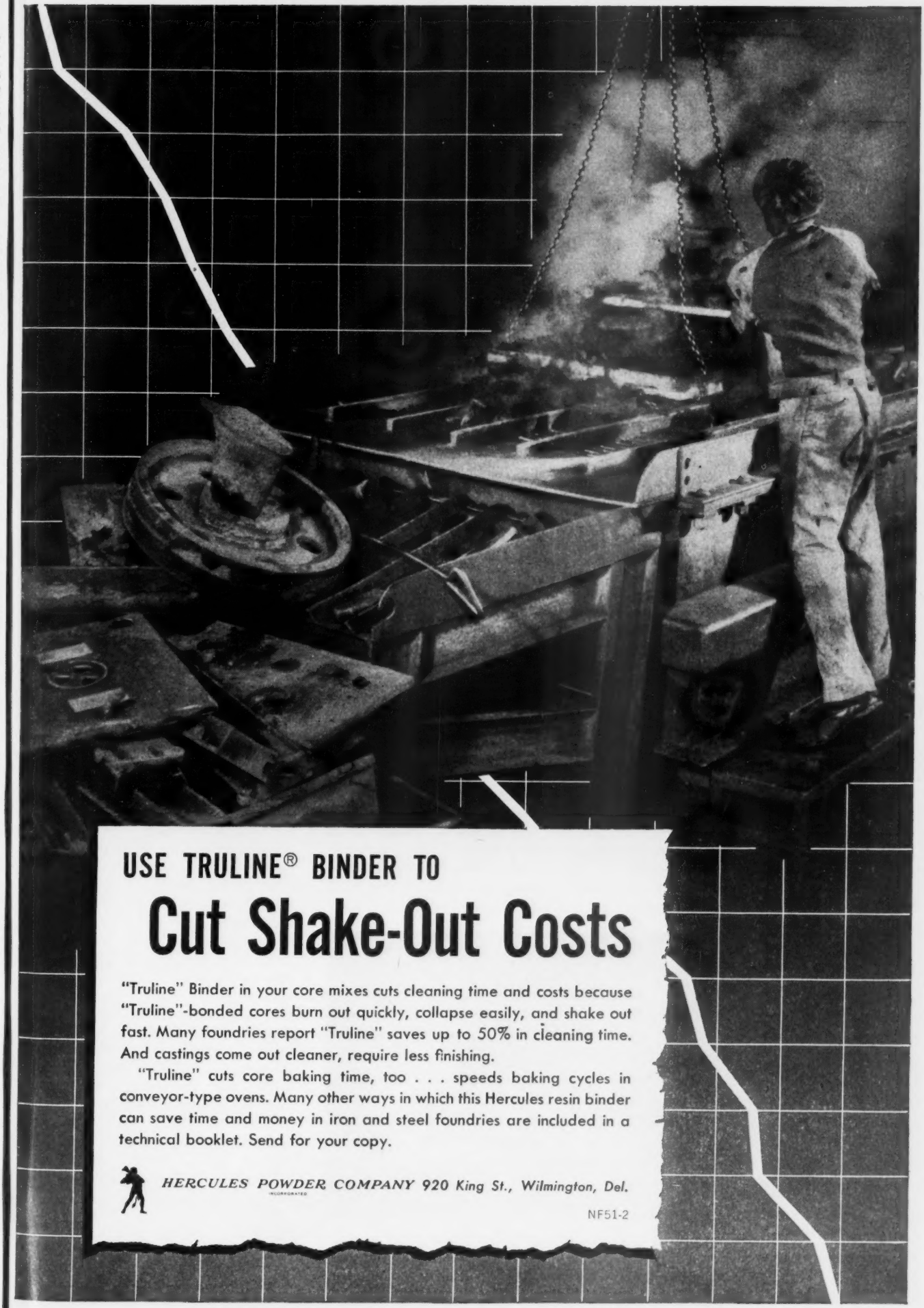
EASTERN NEW YORK Chapter of the AFS heard E. C. Troy, foundry engineer, Riverton, N. J., speak at its Mar. 20 meeting. Left to right, are: E. S. Lawrence and A. J. Kiessler, General Electric Co.; Mr. Troy; L. M. Townley, Adirondack Foundries & Steel Inc., and Leo Scully, Scully Foundry & Machine Co.



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(*Concluded from page* 168)

brought into the foundry, bond was mulled into it in the conventional manner—western bentonite for bonding the sands on the iron floor, southern bentonite for the nonferrous sands. The sand is maintained in heaps on concrete floors. The iron floor sand always is mulled and aerated prior to use. Sand on the nonferrous floor has the moisture cut in and is then aerated. Mulling is resorted to only when bond additions are made.

Green, skin-dry, and dry sand models are made by the foundry students and data kept on these molds have accumulated to a considerable extent. Special molds and data are prepared by A. L. Nelson for the research program.

All molding and dry sand core work is done satisfactorily with olivine sand. The research project, however, will deviate from routine foundry operation in that the overall study will be divided into a number of projects. Each project will be investigated in turn.

Basically the research program is to study olivine as a molding material rather than merely to make a comparison with existing molding sands. Comparative tests at this time would necessitate following known practices with silica, and this might tend to retard development.

The first phase of the research will cover molding and core sands for iron castings. The project now under way is an investigation of flowability and general molding characteristics of molding sand composed of olivine, western bentonite and water. Olivine is a basic refractory and, consequently, will be fluxed in any clays now used as bonding materials. However, western bentonite can be used and a high fusion point maintained. The angular grain shape poses some problems in general workability.

No indication of fusion has been observed in work to date, although some castings show burn-on and are difficult to clean. This condition is the result of metal penetration. It can be prevented through the use of a satisfactory mold surface. This is not an alarming situation since the present heap sand is producing castings easily cleaned when hard ramming is used. Neither "shake-on" nor wash facings are necessary to produce easily cleaned castings.

Present investigations of various grain distributions, clay and moisture contents are directed toward developing a sand that will present a satisfactory surface with least ramming effort. Fig. 4 shows a group of representative iron castings produced by students. The mold for the 20-lb anchor, shown at right center, was made on a jolt, rollover, pattern-draw molding machine. Molds for the cylinders and andiron were produced with jolt-squeeze machines. Other castings shown were poured in hand rammed molds. Graphite shake-on facing was used in these molds.

An iron casting made without the use of graphite is shown in Fig. 1. This ornamental andiron part, cast in a mold of finer grain sand than the castings shown in Fig. 4, was cleaned by shot-blasting.

Actual testing of sands under consideration is performed by special molds carrying rammed specimen inserts. Each mold accommodates four inserts, one a control specimen. Ten molds prepared for each test heat are poured rapidly and pouring temperatures recorded. Thus far, pouring temperatures range from 2400 to 2475°F.

The second phase of investigation will be concerned with various mold washes on olivine sand molds. Tests are to be conducted on washed and skin-dried inserts in the test molds previously described. Preliminary trials have produced some castings that stripped so well that it was unnecessary to use shot-blasting in cleaning. An example is shown in Fig. 3. This mold, graphite washed and skin dried, was produced by students. Although the casting was stripped from the mold while extremely hot, it shows a satisfactory separation at the metal-sand interface. This particular casting was sand-blasted prior to photographing.

A third project to be undertaken will be a study of the use of atmosphere-forming agents with molding sands. Preliminary test castings from molds containing organic materials with the sand have shown good results.

A fourth project will be the study of scabbing tendencies of the sands investigated in the first project. Special mold shapes that tend to scab are projected. This investigation will be extended to include scabbing tendencies where buffer agents have been added.

Olivine in dry sand cores will conclude investigation on the first phase of the research program.

Second phase will be a study of olivine sands for the production of nonferrous castings. Fig. 2 shows functional aluminum alloy castings made by students. These castings are processed in the machine tool laboratory where they show up no differently from castings made in routine sands.

Final investigation will determine the value of olivine fines in producing resin-bond shell molds. Preliminary tests indicate that fines removed after crushing olivine rock may provide an excellent sand for this process.

Obviously the research project is an ambitious one. We feel that the properties of olivine are deserving of this broad study. Further, it is our opinion that in the event of a national emergency, knowledge of olivine foundry sands will be of fundamental concern to the entire industry. Properties unique to olivine hygienic value and its low expansion tendencies, are sufficient in themselves to recommend it as a successful molding sand aggregate.

CENTRAL ILLINOIS: Shown above at the chapter's March meeting, left to right, are: Walton L. Woody, national AFS president; Frank W. Shipley, national AFS director, and William W. Maloney, national AFS secretary. Photo furnished through the courtesy of Fred Brosmer, Caterpillar Tractor Co.

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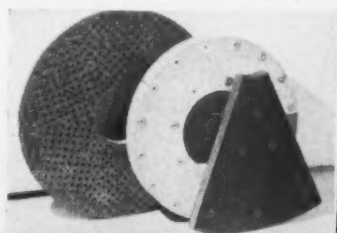
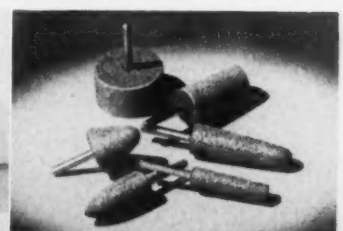


INSERTED NUT and PLATE MOUNTED DISCS



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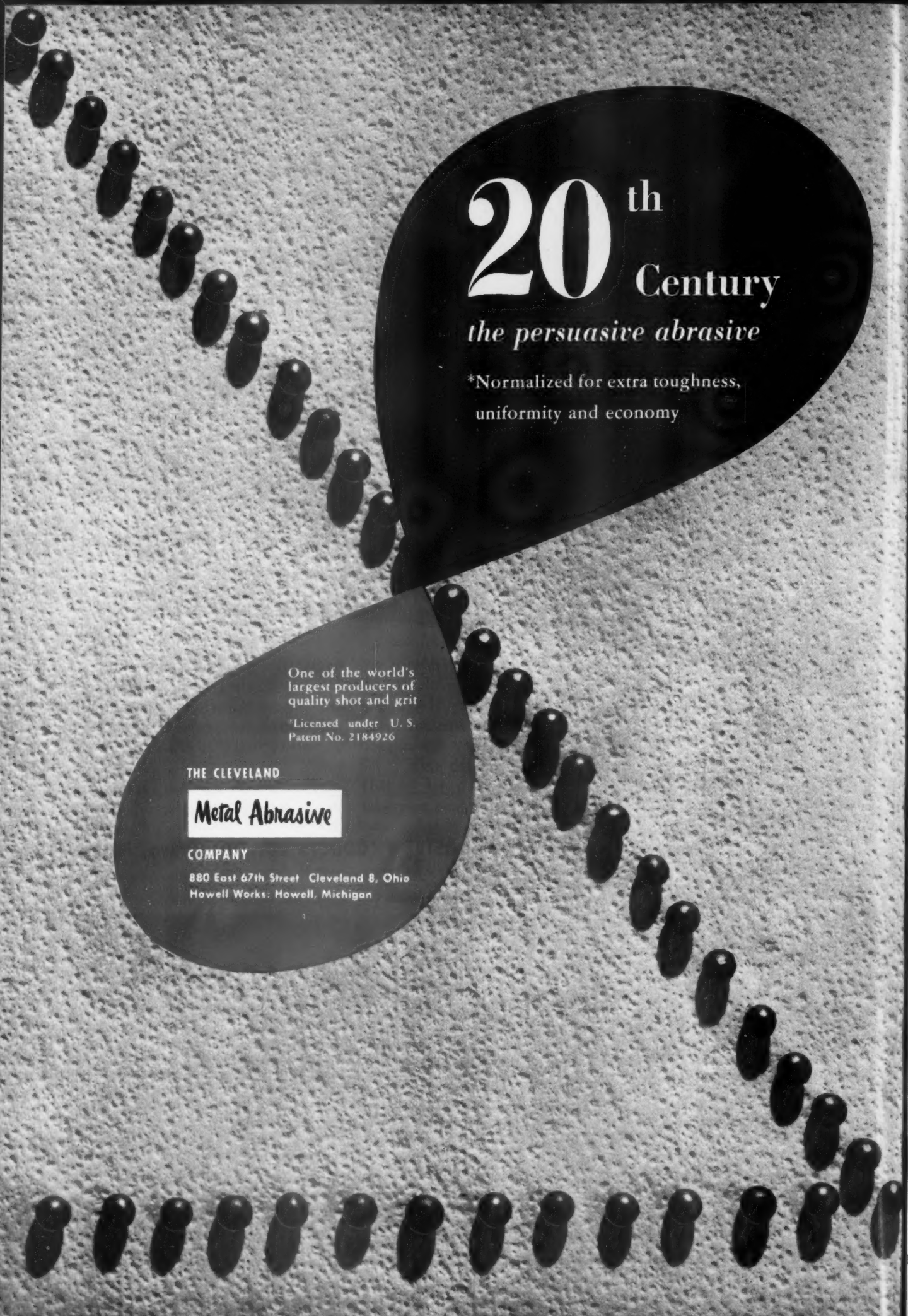
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Foundry STATISTICS

Malleable Iron

(Shipments of castings—net tons[1])

	Shipments		Unfilled Orders[2]
	Total	For Sale	
1948	933,265	525,212	.....
1949			
Dec.	57,379	29,679	60,835
Total	713,330	371,214	.....
1950			
Jan.	62,874	32,918	62,307
Feb.	60,386	31,249	67,049
Mar.	66,259	38,639	69,866
Apr.	69,822	36,279	76,250
May	76,161	42,432	77,074
June	82,345	46,613	86,783
July	67,514	37,198	105,300
Aug.	86,021	50,019	132,374
Sept.	82,479	46,927	152,583
Oct.	89,968	50,157	160,278
Nov.	85,163	48,670	180,099
Dec.	91,510	51,091	194,950
Total	920,502	512,192	.....

Copper-base Alloy

(Shipments of castings—1000 pounds[1])

	Shipments			Unfilled Orders[2]
	Total	Sand	Perm. Mold	
1949	724,053	654,444	37,311	.....
1950				
Jan.	65,585	58,878	3,440	25,216
Feb.	67,029	60,257	3,626	26,923
Mar.	80,442	71,876	4,693	27,631
Apr.	72,318	64,773	3,848	28,769
May	79,108	71,605	3,751	30,880
June	83,023	74,990	3,896	32,808
July	69,033	62,414	3,789	39,906
Aug.	94,013	85,948	4,258	52,513
Sept.	95,641	87,111	4,630	58,673
Oct.	105,746	96,911	5,064	66,560
Nov.	103,694	93,607	5,776	67,931
Dec.	100,548	90,513	5,985	69,569
Total	1,016,180	918,883	52,756	.....
1951				
Jan.	100,703	91,204	5,390	77,597

Aluminum

(Shipments of castings—1000 pounds[1])

	Shipments				Unfilled Orders[2]
	Total	Sand	Perm. Mold	Die	
1949	304,409	106,825	102,908	87,812	.....
1950					
Jan.	28,801	9,646	9,400	9,052	40,591
Feb.	28,887	10,171	9,358	8,851	44,235
Mar.	35,845	13,035	11,094	10,870	47,350
Apr.	33,356	11,091	10,656	10,795	49,952
May	36,031	11,526	11,928	11,799	52,580
June	37,600	12,677	11,825	12,173	53,309
July	30,152	9,613	9,808	9,943	63,892
Aug.	39,852	14,117	12,682	12,207	82,564
Sept.	42,061	14,369	13,085	13,594	89,723
Oct.	47,278	15,994	14,893	15,408	102,938
Nov.	46,816	16,099	14,040	15,715	67,931
Dec.	45,999	15,675	15,052	14,322	104,380
Total	452,610	154,013	143,821	144,661	.....
1951					
Jan.	42,672	14,518	14,570	12,641	93,418

Magnesium

(Shipments of castings—1000 pounds[1])

	Shipments		Unfilled Orders[2]
	Total	For Sale	
1949	9,364	8,781	....
1950			
Jan.	814	762	2,237
Feb.	735	676	2,218
Mar.	903	849	2,322
Apr.	799	751	2,305
May	810	762	2,282
June	758	698	2,482
July	727	677	3,356
Aug.	1,147	1,078	4,855
Sept.	1,231	1,154	4,942
Oct.	1,354	1,297	5,573
Nov.	1,508	1,434	6,928
Dec.	1,528	1,444	6,958
Total	12,314	11,582	....
1951			
Jan.	1,840	1,739	8,616

Foundry Production Workers

Estimated Number

	Jan. 1951	Dec. 1950	Jan. 1950
Gray Iron	160,800	160,500	121,800
Malleable	27,000	25,600	20,600
Steel	55,300	54,900	33,300
Nonferrous	94,300	93,900	66,000

Average Weekly Earnings

Gray Iron		$72.22	$57.82
Malleable Iron		72.11	59.29
Steel		72.91	58.83
Nonferrous		78.03	62.73

Average Weekly Hours

Gray Iron		44.5	39.2
Malleable Iron		43.7	38.3
Steel		43.5	38.1
Nonferrous		43.4	39.7

Labor Turnover Rate (Dec.)

(Per 100 employees)

	Total Accession	Total Separation	Quit	Layoff
Gray Iron	3.9	4.6	2.8	0.7
Malleable Iron	4.9	3.5	2.6	..
Steel	6.4	3.2	2.4	0.2
Nonferrous	4.6	3.7	2.1	0.8

Source: Bureau of Labor Statistics

Gray Iron Castings—Shipments

(Net tons[1])

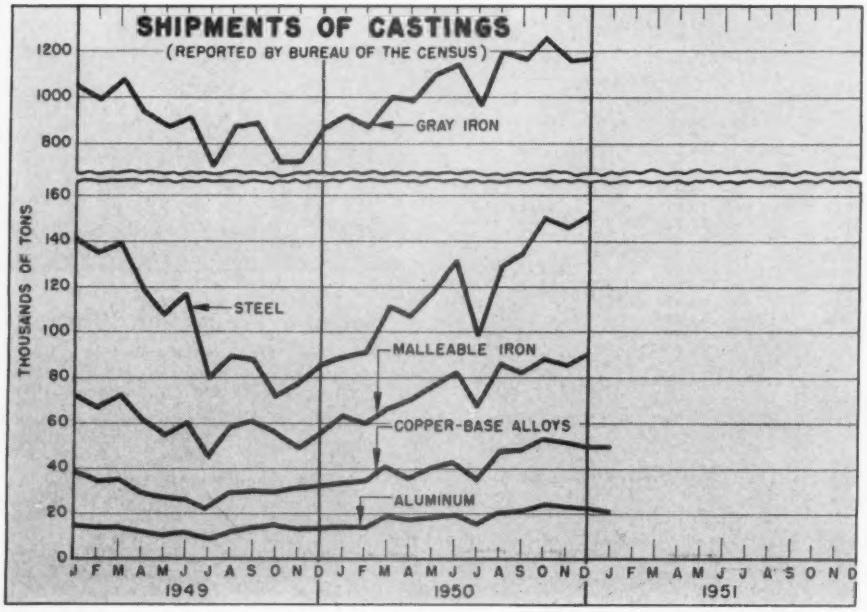
	All Castings		Miscellaneous Castings		Heavy Steel Ingot Molds		Chilled Railroad Car Wheels		Pressure Pipe & Fittings	Soil Pipe & Fittings	Unfilled Orders[2]
	Total	For Sale	Total	For Sale	Total	For Sale	Total	For Sale	Total[3]	Total[3]	Total
1948	12,785,909	7,131,405	8,296,843	3,839,671	1,979,740	865,022	719,784	641,164	1,149,553	639,989	.....
1949											
Dec.	862,172	440,409	521,613	200,760	183,660	87,241	34,772	30,281	65,764	56,363	892,458
Total	10,549,284	5,521,441	6,624,420	2,675,411	1,776,242	759,860	555,569	493,117	1,029,743	563,310	.....
1950											
Jan.	913,321	449,577	573,743	214,752	188,152	88,244	34,254	29,409	64,095	53,077	914,185
Feb.	864,189	416,594	551,060	201,468	169,605	75,832	33,417	29,187	63,363	46,744	873,455
Mar.	995,782	500,195	635,403	244,122	170,082	71,317	44,898	39,357	89,264	56,135	921,575
Apr.	981,126	483,862	621,368	233,397	182,420	77,923	42,768	37,972	82,774	51,796	922,255
May	1,095,111	572,887	684,632	277,447	195,021	86,016	46,219	40,185	104,529	64,710	977,833
June	1,136,129	613,084	713,811	300,863	197,474	91,377	45,672	41,672	106,980	72,192	1,039,618
July	961,450	507,867	595,918	241,632	177,154	82,363	35,066	30,560	94,438	58,874	1,286,579
Aug.	1,201,569	677,134	747,046	335,868	199,770	92,340	52,508	46,681	131,127	71,118	1,670,380
Sept.	1,159,240	648,966	722,667	325,019	203,191	94,968	44,707	40,304	121,556	67,119	1,794,118
Oct.	1,254,901	700,512	792,764	364,607	220,821	100,082	46,516	41,023	119,105	75,695	1,839,866
Nov.	1,160,770	656,745	733,570	343,073	194,271	85,057	44,382	40,068	115,465	73,082	1,930,176
Dec.	1,181,974	652,929	745,766	333,033	210,700	98,071	43,667	39,984	111,066	70,775	618,278
Total	12,905,562	6,880,352	8,117,748	3,415,281	2,308,661	1,043,590	514,074	456,402	1,203,762	761,317	.....

Steel Castings—Shipments

(Net tons[1])

	All Castings			Carbon Steel			Alloy Steel			Unfilled Orders[2]
	Total	For Sale	Railway Specialties[3]	Total	For Sale	Railway Specialties[3]	Total	For Sale	Railway Specialties[3]	Total
1948	1,760,032	1,335,295	442,258	1,366,913	1,063,027	425,965	393,981	272,374	16,293	.....
1949										
Dec.	85,033	53,079	9,258	60,864	37,205	8,831	23,644	15,874	427	122,887
Total	1,250,460	865,297	232,976	944,232	659,454	223,310	299,270	205,843	9,666	.....
1950										
Jan.	88,821	57,996	9,298	64,616	41,559	8,607	24,205	16,437	691	142,484
Feb.	91,827	62,045	10,920	66,843	44,473	9,589	24,984	17,572	1,331	165,186
Mar.	111,772	77,588	15,281	82,458	56,492	14,012	29,314	21,096	1,269	185,611
Apr.	106,964	75,133	17,406	79,912	56,008	16,124	27,052	19,125	1,282	201,643
May	117,944	83,845	20,552	88,202	63,658	18,811	29,742	20,187	1,741	198,078
June	131,097	94,637	27,065	96,365	72,427	24,653	34,732	22,210	2,412	206,799
July	98,269	68,874	15,734	70,122	51,204	14,577	28,147	17,670	1,157	255,418
Aug.	128,369	94,413	24,922	92,197	70,721	22,952	36,172	23,692	1,970	329,944
Sept.	134,574	96,738	25,295	98,523	74,052	23,992	36,051	22,686	1,303	427,969
Oct.	149,558	109,660	30,048	112,704	85,157	28,493	36,854	24,503	1,555	521,846
Nov.	145,929	108,263	30,775	110,476	84,316	29,245	35,453	23,947	1,530	537,666
Dec.	155,258	113,692	34,061	118,744	88,552	32,160	36,514	25,140	1,901	554,187
Total	1,459,382	1,042,884	261,357	1,081,162	788,619	243,215	379,220	254,265	18,142	.....

[1] Source: Bureau of the Census. [3] All cast iron pipe is shipped for sale. [2] For sale only.



Index of Foundry Equipment Orders

Foundry Trades Only

(Net Orders Closed, New Equipment)

	1950	19
Jan.	159.3	66
Feb.	113.1	63
Mar.	225.2	
Apr.	160.6	
May	294.9	
June	622.7	
July	401.8	
Aug.	693.6	
Sept.	483.8	
Oct.	526.8	
Nov.	885.5	
Dec.	526.2	

Note: Figures are percentages of the base period 1937-1939 taken as 100 per cent (monthly average). Source: Foundry Equipment Manufacturers Association.

Ingot Brass and Bronze

(Shipments in net tons)

	1950	1951
Jan.	18,874	28,416
Feb.	18,487	27,168
Mar.	22,494	.....
Apr.	22,118	.....
May	23,643	.....
June	25,093	.....
July	21,609	.....
Aug.	29,689	.....
Sept.	28,811	.....
Total for year	303,563	.....

Zinc-Base Alloy

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1949	377,779	248,679	.....
1950			
July	42,188	25,252	62,467
Aug.	47,212	29,897	80,318
Sept.	49,079	31,125	89,787
Oct.	51,031	33,287	97,102
Nov.	48,852	32,844	102,524
Dec.	47,818	31,161	102,636
Total	536,398	341,833	.....
1951			
Jan.	38,233	24,713	87,953

Coke Production and Consumption

(Net tons*)

	Production	Consumption Total	Consumption By Foundries
1949	63,637,429	63,462,233	2,778,868
1950			
Jan.	5,482,034	5,893,697	253,057
Feb.	3,994,106	4,628,331	201,927
Mar.	5,280,660	5,371,012	241,844
Apr.	6,156,294	6,005,632	277,673
May	6,397,032	6,385,493	294,334
June	6,238,067	6,255,094	276,555
July	6,368,489	6,265,821	267,142
Aug.	6,417,404	6,420,483	278,306
Sept.	6,263,214	6,243,584	274,657
Oct.	6,649,935	6,543,428	332,444
Nov.	6,243,970	6,131,733	317,120
Dec.	6,606,464	6,590,823	322,458
Total	72,097,669	72,735,131	3,337,517
1951			
Jan.	6,769,376	6,744,322	331,421

Iron and Steel Scrap Consumption

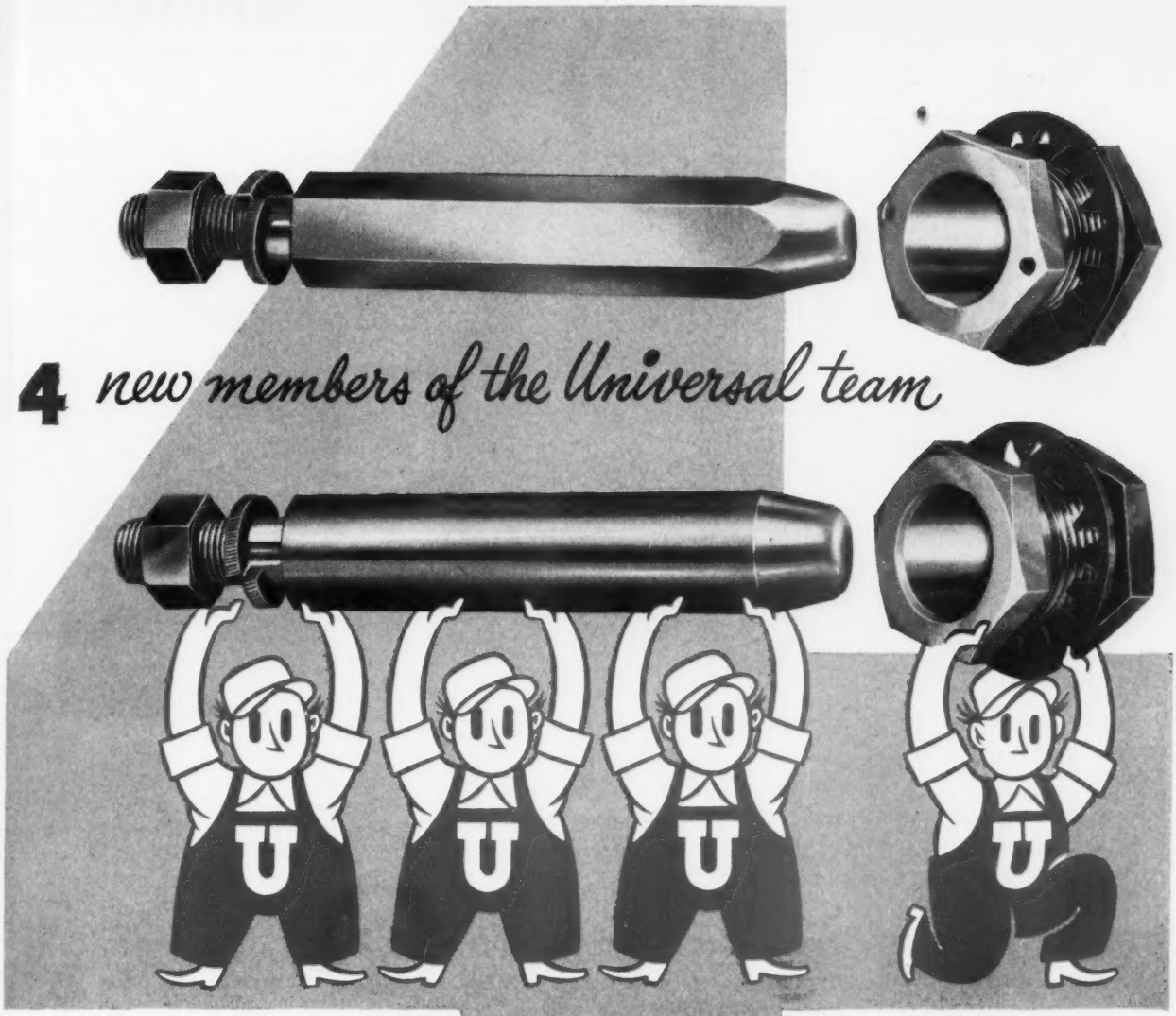
(Thousands of gross tons*)

	All Scrap—Total	All Scrap—Purchased	By Type of Furnace: Cupola—Total	Cupola—Purchased	Air—Total	Air—Purchased	Electric—Total	Electric—Purchased
1949								
Dec.	4,750	2,229	666	332	67	23	379	233
Total	49,281	22,922	7,968	4,175	801	276	4,239	2,608
1950								
Jan.	4,906	2,267	699	337	71	25	433	259
Feb.	4,539	2,149	670	315	71	27	417	253
Mar.	5,101	2,430	778	372	87	31	497	296
Apr.	5,119	2,451	766	365	79	29	493	300
May	5,333	2,552	837	416	85	32	539	324
June	5,122	2,483	864	427	92	33	533	317
July	4,708	2,244	669	318	79	28	490	295
Aug.	5,202	2,454	862	426	108	39	568	327
Sept.	5,170	2,468	819	404	109	40	579	348
Oct.	5,643	2,707	866	437	108	40	643	384
Nov.	5,293	2,598	841	431	107	39	593	364
Dec.	5,361	2,600	803	418	122	44	600	361
12 Mo.	61,497	29,403	9,474	4,666	1,118	407	6,385	3,828

Pig Iron Production and Consumption

	Production**—Total	Production**—Foundry	Production**—Malleable	Production**—Basic	Production**—Low Phos. Intermediate Low Phos. & Bessemer	Consumption*—Total	Consumption*—Cupola	Consumption*—Air	Consumption*—Electric
	(Standard grades—1000 net tons)					(By type of furnace, 1000 gross tons)			
1949	53,408.7	2,821.9	2,294.5	41,312.5	6,979.8	47,928	4,510	235	96
1950									
Feb.	4,120.1	151.1	187.9	3,239.3	541.8	3,890	396	20	80
Mar.	4,546.8	232.4	201.2	3,554.9	558.3	4,267	448	23	8
Apr.	5,502.8	259.2	229.1	4,298.3	716.2	4,954	449	23	11
May	5,773.6	257.7	223.5	4,572.3	720.1	5,203	474	24	13
June	5,549.3	209.5	257.7	4,393.8	688.3	5,033	494	25	13
July	5,804.2	269.3	282.2	4,561.2	691.5	5,018	403	23	14
Aug.	5,706.2	257.0	284.0	4,407.3	757.9	5,136	516	30	18
Sept.	5,614.6	244.0	257.2	4,380.9	732.5	5,092	500	26	17
Oct.	5,836.8	284.1	260.6	4,541.2	741.0	5,219	466	31	13
Nov.	5,316.5	277.1	279.1	4,093.7	666.6	4,817	462	30	14
Dec.	5,609.2	264.9	260.2	4,374.4	709.8	5,068	456	34	15
12 Mo.	64,589.1	2,870.4	3,034.2	50,450.5	8,234.0	58,416	5,475	319	326
1951									
Jan.	5,801.7	300.0	233.3	4,529.8	738.6	....	....	...	...
Feb.	5,084.8	238.7	226.0	4,007.2	612.9				
2 Mo.	10,886.5	538.7	459.3	8,537.0	1,351.5	....	....	...	...

* Source: U. S. Dept. of Interior, Bureau of Mines. ** Source: American Iron & Steel Institute. [1] Source: Bureau of the Census. [2] For sale only.



threaded flask pins and bushings now added to the UNIVERSAL quality line

To an already famous team of foundry equipment, Universal has now added a threaded series of Flask Pins and Bushings that will save you precious minutes by assuring instant and accurate alignment of cope and drag. Like other members of this famous team, they'll also save the cost and downtime that replacement always requires because they're heat-treated and precision ground from high quality steel to stand up under rough treatment. Universal threaded series Flask Pins and Bushings are used in steel, aluminum, magnesium or other light metal flasks. Bushings are available in both the round and elongated types; pins in both round and hexagonal types. Universal carries a complete line of sizes of its threaded series as well as its taper and plain series Pins and Bushings as regular stock items. Direct your inquiries and orders to the office nearest you . . . 1060 Broad Street, Newark, N. J., 5035 Sixth Ave., Kenosha, Wisc., or the home office.

150

UNIVERSAL ENGINEERING COMPANY, FRANKENMUTH 4, MICHIGAN

the WHEELABRATOR® Swing Table SAVES for Job Shop and Production Foundry

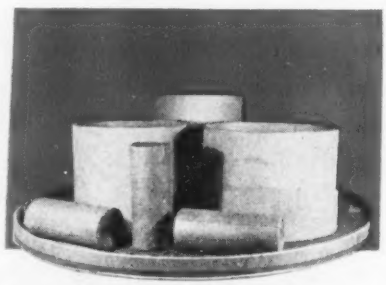
Impressive performance records are being made with the Wheelabrator Swing Table in job shops and high production foundries alike. With this versatile multi-purpose machine large intricate castings and small fragile parts are cleaned at the same high speed and low cost—a fact proved in more than a hundred installations.

cuts cleaning costs 66%

The Elkhart Iron Works of Elkhart, Indiana uses a Swing Table to clean work formerly done in 3 tumbling mills and an airblast room. The Swing Table has reduced cleaning costs per ton from $8.095 to $2.655. It has also eliminated costly breakage and produced a finish that is much more satisfactory to their customers.

cleans 20 tons of castings at cost of 6 tons

A Swing Table at the Toronto Foundry Company is cleaning 2/3rds more work with ½ the labor. It has cut metal cleaning costs 76%, saved 10% in machining costs and eliminated all breakage. The savings it makes will pay its complete cost in 2 years.



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AMERICAN WHEELABRATOR & EQUIPMENT CORP., 505 S. Byrkit St., Mishawaka 2, Indiana

OBITUARY

RUSSELL F. LINCOLN, 59, president, Russell F. Lincoln & Co., Cleveland, died Apr. 6, following a heart attack. Mr. Lincoln, a native of Quincy, Mass., was educated in the public schools of Cleveland and spent 12 years in the employ of the Winchester Repeating Arms Co., New Haven, Conn. During World War I

RUSSELL F. LINCOLN

he was a lieutenant in the Air Corps, and after its close entered the foundry industry, completing a special course in metallurgy and metallography of iron and steel at Cleveland College. In 1922 Mr. Lincoln joined the Machine Division of Osborn Mfg. Co., Cleveland, became assistant sales manager in 1933 and sales manager in 1939. He resigned in 1944 to head his own company, acting as a manufacturers' agent in Cleveland and the Ohio territory for various foundry equipment manufacturers. Active in the organization of Northeastern Ohio Chapter of the AFS, Mr. Lincoln served as its secretary-treasurer for a number of years, vice president, and president in 1944-45.

* * *

George G. Adam, 49, New England sales engineer for the Machine Division, the Osborn Mfg. Co., Cleveland, died Mar. 31 at his home in Ridgewood, N. J. Mr. Adams, who was associated with the company for 30 years, worked in the engineering department in Cleveland prior to moving East 17 years ago.

* * *

Stuart A. Dussault, 41, president-general manager, Dussault Foundry Corp., Lockport, N. Y., died Mar. 5, in Madrid, Spain, while on a tour of Europe.

* * *

Joseph F. Buhrle, 70, co-founder of Lakeside Bronze Inc., Buffalo, died there Mar. 4, in Deaconess Hospital.

A native of Buffalo, Mr. Buhrle was superintendent of Buffalo Bronze Corp. for 15 years. He had been vice president-treasurer of Lakeside Bronze Corp. for 19 years.

* * *

William Watson Sr., 82, former vice president in charge of manufacturing, Allis-Chalmers Mfg. Co., Milwaukee, died Mar. 13 at his home there. Mr. Watson joined the company in 1901 at its Scranton, Pa. works. Later he was general works manager of all tractor and general machinery plants and from 1932 until 1941 vice president in charge of manufacturing.

* * *

Edmund W. Buck, 84, who retired in 1946 as executive vice president, Western Foundry Co., Chicago, died Jan. 20, at his winter home in Clearwater, Fla.

* * *

C. W. Morisette, assistant professor and foundry instructor in the Department of Industrial Engineering, Pennsylvania State College, died Mar. 21. He was formerly foundry practice instructor, Milwaukee Vocational School.

* * *

John W. Jackson, 47, president, Nelsonville Foundry & Machine Co., Nelsonville, O., died there Mar. 15.

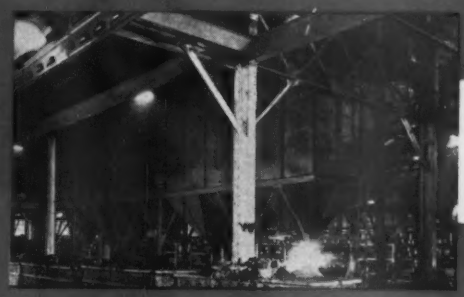
* * *

Edwin S. Carman, 73, founder and for 20 years president, Edwin S. Carman Inc., Cleveland, foundry engineers and consultants, died Mar. 30 following an illness of several years.

EDWIN S. CARMAN

Mr. Carman, until he founded his own company in 1928, was associated with American Machinery Mfg. Co. and its successor, Johnston & Jennings Co., and Osborn Mfg. Co., Cleveland. He designed the first successful power-operated cylinder molding machine which he perfected in 1912. His son, Thornton S. Carman, is president of the company which Mr. Carman recently headed as board chairman.

"Not a dime for repairs in years"



at the OLIVER CORPORATION

as one DUSTUBE ventilates

12 grinders
6 tumbling mills
3 blast cleaning machines

In the gray iron foundry of the Oliver Corp., South Bend, Indiana, one large Dustube Collector is ventilating 6 double end grinders, 6 tumbling mills, Wheelabrator Monorail Cabinet and two Wheelabrator Tumblasts. Although this Dustube is collecting an unusually heavy volume of dust, it effectively controls all dust without trouble. Mr. James Reddrick, Superintendent of Maintenance, explains the trouble-free operations of the Dustube as follows:

Mr. James Reddrick

"We have not spent a dime for repairs in years. Maintenance is easy and inexpensive with few working parts to wear. Inspection of the tubes takes only a few minutes time of our regular oiling crew—one glance tells tube conditions. The Dustube is certainly the least expensive of all dry type collectors to operate and maintain, and I can go one step further and say that the Dustubes are the most trouble-free units in our whole plant."

The record of the Dustube for efficient dust collection at less cost is worth investigating. Write today for full information.

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HIGH SPEED GRINDING WHEELS

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Since we have been producing our own abrasives in our Canadian Electric Furnace Plant, coupled with maximum utilization of new developments in resin bonds, Electro's chemists and engineers have had a latitude in development work that they never had before.

The gains they have achieved in faster, cleaner cutting at lower temperatures are out of all apparent proportion to the fractional improvements in wheel composition, shape and size selection.

If a run is ahead of you on multiple castings of a given type or grade of metal, identical in shape and size, let us send a Field Engineer to show you how much you can gain with Electro Portable Wheels engineered to the job in hand.

Comparable gains for cutting-off, rough and precision grinding are demonstrable. Write, wire or phone. Job-side cooperation by an Electro Field Engineer places you under no obligation whatever.

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ELECTRO-CARB *(Silicon Carbide)* ABRASIVE GRAIN & GRITS

K-390

Electro HIGH-SPEED RESIN BONDED GRINDING WHEELS

Discuss Research Work At ASTM Meeting

During the American Society for Testing Materials Committee Week in Cincinnati, Mar. 5 to 9, much new research work was discussed at some 200 meetings of the society's technical committees, and many new specifications and tests for materials and numerous revisions were completed. Registered attendance was 835.

Committee A-3 on Cast Iron is developing specifications for nodular cast iron, cast iron for elevated temperature, and chilled or white cast iron, as well as recommended practice for brinell hardness testing of cast iron. Specifications governing use of cast iron for pressure vessel service up to 650°F have been approved and forwarded to the American Society of Mechanical Engineers for processing into the Boiler Code. Some work on classification of fractures of cast iron has been initiated and it is proposed further to explore impact testing, corrosion testing and hydrostatic pressure testing.

Committee B-5 on Copper and Copper Alloys, Cast and Wrought is developing specifications for copper and copper alloy centrifugal castings, and for grades of copper-base, nickel-tin-zinc casting alloys.

Committee B-7 on Light Metals and Alloys, Cast and Wrought recommended changes in specification B 80-49T on magnesium-base alloy sand castings, and B 199-49T on magnesium-base alloy permanent mold castings. The committee also has prepared, subject to letter ballot, for submission to the society in June a "Tentative Recommended Practice for Codification of Light Metals and Alloys, Cast and Wrought." Future work includes consideration of a specification for plaster-mold investment castings, and a comprehensive aluminum and magnesium atmospheric exposure test program.

Committee E-1 on Methods of Testing has organized a new task group on shear and torsion tests. It also has completed a new tentative method of test for diamond pyramid hardness (Vickers) of metallic materials, and has approved for action by the society in June a new hardness conversion table for nickel and nickel alloys which covers relationship between diamond pyramid, brinell and Rockwell hardnesses. A set of recommendations for speed of testing in tension determinations was completed.

Committee E-4 on Metallography practically has completed a glossary of metallographic terms comprising upward of 1500 definitions, and is

balloting on new Tentative Methods for Estimating the Average Grain Size of Nonferrous Metals and Alloys, Other than Copper and Copper-base Alloys.

Committee E-7 on Non-Destructive Testing is engaged in writing several ultrasonic and magnetic particle testing methods. Most nearly approaching completion is one covering magnetic particle testing by the dry powder prod method. The committee is also attempting to establish radiographic standards for steel welds, and is laying groundwork for an international symposium in 1952 on nondestructive testing.

Ingot Brass and Bronze Council Organized

Defense Council of the Ingot Brass & Bronze Industry was organized by brass and bronze ingot manufacturers Mar. 1 at a meeting in Chicago. Purpose of the council is to co-operate with government agencies and to collect, collate and disseminate information with respect to and affecting the industry in connection with defense requirements. Membership is open to all brass and bronze ingot producers.

Otto Barth, Barth Smelting Corp., was elected chairman and I. Glueck, secretary-treasurer. Council headquarters are at 308 West Washington St., Room 1601, Chicago 6.

French Industry Team Tours Smelting Plants

Increased production and savings of manpower for France's defense effort are major objectives of a French secondary nonferrous metals smelting and refining industry team which recently visited this country under sponsorship of the Economic Co-operation Administration.

The 15-member team toured smelting and refining plants studying the industry's entire process. Of particular interest were methods of sampling and sorting scrap and dross, simplification of work methods, general plant organization for greater efficiency, and labor relations.

Instrument Conference

Sixth National Instrument Conference and Exhibit will be held at the Sam Houston Coliseum, Houston, Tex., Sept. 10-14. The exhibit is being held in Houston for the first time and is expected to draw 10,000 executives, engineers and others in charge of instrumentation in science and industry.

1901-1951

50th Anniversary

Today, more than ever, you can look to

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After you've fought the battle of high costs, "criticals" and shortages—don't waste materials through careless handling! Tighten your control at every step! See that you have up-to-date scales —and enough scales—throughout your foundry. Look into the advantages of Printweigh in stopping losses that originate through human errors. Whatever your problems in receiving, charging, counting or other weighing operations . . . there's a modern Toledo to do the job with utmost *accuracy, speed* and *dependability.*

Today in your community you'll find Toledo as near as your phone; Toledo sales and service offices in more than 200 cities ready to help you in the selection or maintenance of scales vital in guarding your materials and costs.

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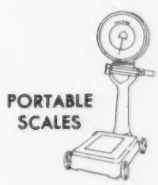
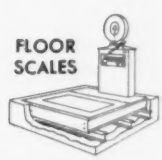
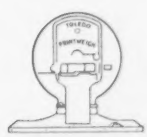
COUNTING SCALES


PORTABLE SCALES


FLOOR SCALES


PRINTWEIGHS

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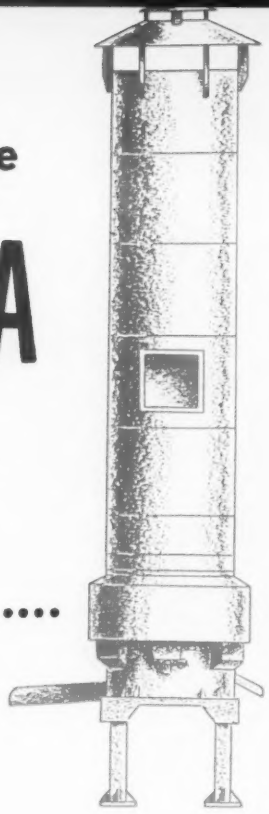
TOLEDO, OHIO . . . Toledo Scale Company of Canada, Ltd., Windsor, Ontario

HEADQUARTERS FOR SCALES

How to use the CUPOLA

By BERNARD P. MULCAHY
President
Fuel Research Laboratory Inc.
Indianapolis



Need for accurate weighing of charges and method of calculating charges are discussed in this fifth of a series of articles

ALL materials charged into the cupola must be weighed accurately. This is essential for several reasons:

1. To properly balance the materials used in arriving at the correct chemical and metallurgical composition.

2. To keep a proper inventory of materials used and an exact control of cost of operation.

3. To have accurate and dependable records of the various mixes used in order to duplicate results and to aid in correcting difficulties encountered.

The scales selected must be within a reasonable limit of the required capacity. Although coke is generally weighed on the same scales as that used for the metal, it is not advisable to do so because of the greater potential error in weighing small quantities on a scales designed for a much greater capacity.

All scales used for charging are subject to heavy abuse, impact, dirt and weather. Because of this they must be periodically cleaned, checked and rebalanced. This should be done by the maintenance department and the cupola crew, but rebalancing should only be done by experienced scale men.

If magnet charging is employed, a weigh hopper is recommended and additionally an adjusting platform should be used. This is to permit the proper adjustment of the individual components of the charge. If this is not done, extreme variations in the components are encountered.

No cupola, regardless of the amount poured, should be charged without weighing each component, because without proper weighing it is impossible to produce metal of reliable composition or to duplicate results.

Records—Every plant should have a daily record of the mix and materials used, even if it only consists of a general record of these quantities.

These records should be made by the person in charge of the charging crew so that the procedure is uniform. The simplest manner of keeping these records is to have a form which fits the particular shop requirements or practice.

If the tonnage poured is small the mix can be calculated on the same sheet on which the charges are recorded. In this manner the record for the entire heat is instantly available. The weight of each component should be shown, including the total as well as the coke/charge, limestone and other flux and alloys (added to charges). In this manner a daily record is available for purpose of accounting as well as for reference in working out succeeding changes.

Supplementing the charging record should be a pouring log maintained by the tapper or the metallurgist. This should show the time log of starting the cupola, wind rates, alloy additions, and pressure, metal temperature and tapping times.

With such records, changes in operations are more accurately calculated, and very frequently it is possible by consulting previous records to determine the changes necessary to correct an operation which has gradually gotten out of control.

Calculating Charges — Calculating a chemical balance for a charge can be done in a simple arithmetical manner, as shown in the accompanying table.

Each component is calculated as follows: Pig iron contains 2.40 per cent silicon and since pig iron represents 30 per cent of the mix, the pig then will contribute 2.40 x .30 or 0.72 per cent silicon to the final mix.

During the melting operation there will be a loss of 10 per cent in silicon and 15 per cent in manganese. At the same time there is a pick-up in sulphur, generally about 0.03 per cent for a normal sulphur coke and when using normal quantities of coke. If the sulphur in the coke or the quantity of coke is higher than normal, the sulphur pick-up will increase proportionately.

Carbon pick-up cannot be calculated because it is dependent on the state of oxidation within the cupola.

(To be continued next month)

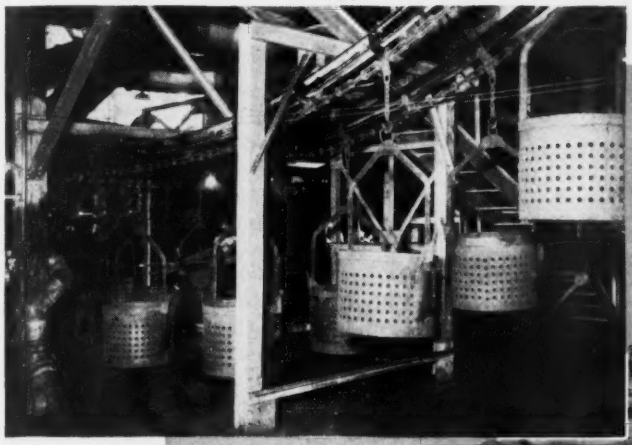
METHOD OF CALCULATING CUPOLA CHARGES

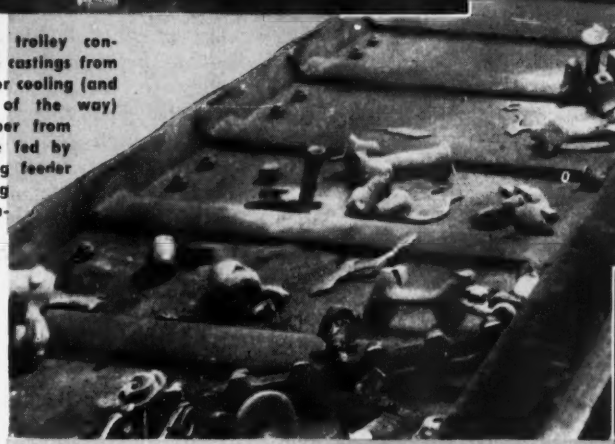
	Charge		—Si—		—Mn—		—P—		—S—		—C—	
	Lb	Per Cent	Per Cent	Per Cent in Mix	Per Cent	Per Cent in Mix	Per Cent	Per Cent in Mix	Per Cent	Per Cent in Mix	Per Cent	Per Cent in Mix
Pig	600	30	2.40	.72	.70	.21	.19	.06	.06	.02	4.1	1.23
Returns	800	40	2.00	.80	.70	.28	.15	.06	.10	.04	3.35	1.34
Pur. scrap	400	20	1.80	.36	.60	.12	.17	.03	.14	.03	3.30	.66
Steel	200	10	.20	.02	.60	.06	.03	.00	.03	.00	.30	.03
Total	**2000**			**1.90**		**.67**		**.15**		**.09**		**3.26**
Coke										.03		.09**
Briquettes			6(1 ±)	.30	3(1 ±)	.15						
Total				2.20		.82				.12*		
Melting loss				.20		.12						
				2.00		.70						
Desired in final iron				2.00		0.70		0.15		0.10		3.35
Ingoing iron				2.20		0.82						

* This may require desulfurization.
** A very reasonable pick-up under good operating conditions.

COMPLETE MECHANIZATION *Proves Out*

NON-STOP PRODUCTION INCREASED VOLUME





Above—Jeffrey trolley conveyors take the castings from the shake-out for cooling (and overhead out of the way) thence to hopper from which they are fed by electric vibrating feeder to the sorting and sprueing conveyor (right).

Left—direct from the cooling conveyor comes this Jeffrey steel apron used for sprueing and sorting the castings. Note electric vibrating feeder in background—it controls the feed to the Apron Conveyor. Below—high speed molding stations with sand at your fingertips. Ask us to tell you more about this vast modernization program.

Completely modernized and Jeffrey-equipped throughout, this large Malleable Foundry has the facilities to turn out large quantities of castings quickly . . . is set up to meet today's prices. Yes, some Jeffrey unit is in there doing its bit to speed the process all along the line (see photos). And you'll like the way Jeffrey Foundry Engineers step up production . . . the way they coordinate each unit to provide peak efficiency and increased volume. A complete line of equipment to make your foundry (small or large) as modern as possible. Let us show you what we can do.

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The Ohio Malleable Iron Co. Columbus, Ohio · *The Fitzgerald & Snyder Mfg. Co., Columbus, Ohio*

Properties of Molding Sands

ABC of Foundry Practice

SATISFACTORY use of sand depends on certain properties which, because of their direct relation to the making of good molds and castings, are called *molding properties*.

Heat affects sand in at least three ways: it burns (oxidizes) organic matter, destroying its bonding value; it drives out not only the moisture or the water used in tempering the sand, but also the combined water which cannot be replaced by retempering the sand; and it fuses particles of sand together and on to the casting.

It has the general effect of destroying the bond, probably due to a combination of the three above-mentioned effects. By driving out the combined water and by fusing the colloids together into larger particles, their sticky nature is destroyed.

The temperature at which sand particles fuse together is determined by their size as well as by their composition; the smaller the particle the lower the temperature at which they fuse or *sinter*.

Measure Fusion Temperature

The fusion temperature of sand as a whole (not the individual particles) is measured by forming it into a cone, and heating it in a high temperature furnace alongside other cones, the fusion temperatures of which are known (Seger cones). A sintering test available commercially measures the softening point of the individual particles; the temperature at which they fuse to a platinum ribbon, heated by an electric current and resting across a specimen of sand, is observed in this test.

While the terms plasticity and flowability do not mean the same thing, they are used to describe the velvety feel, yielding quality, and flowing quality recognized in good heap sand as contrasted with the harsh feel of poor sand. Molding sand is by no means as plastic as clay but must have a certain degree of plasticity to work well. The term flowability refers particularly to that quality of a sand which enables it to pack against the sides of a pattern well, without excessive ramming and tucking.

While not fully understood, these properties seem to be related closely to clay and colloid content. Sands containing the proper amount of clay, particularly colloidal clay, well distributed over the surfaces of the grains are more plastic and more mobile than those containing too little or too much clay. Too little such clay results in a harsh sand; too much produces a heavy gummy sand that cannot be rammed against the mold without great effort. Sands of proper plasticity are not so apt to ram off or strain.

Molding sand must cling together with sufficient strength to enable the mold to retain the shape of the pattern even when molten metal flows against it with considerable force. Weak sands require the excessive use of bars and gaggers to hold them in place. They result in mold drops, stickers, and in strained or cracked molds. Weak sands cut and wash, producing dirty or rough castings. On the other hand, a very strong sand is less mobile, so requires much labor to tuck into the corners and ram properly.

Sand which is too dry does not ram up into strong molds or cores; with increased moisture content, the green bond strength of the rammed mold or core increases to a maximum value and then decreases.

Wet sand flows well and packs closely but is weak. Fine sands and sand of a wide variety of grain sizes usually have higher green bond than coarse and uniform grained sands. Clay, especially colloidal material, is a good bonding agent for both green and dry molds. Organic binders such as molasses, glutrin, flour, etc. are good binders but burn out readily. Any bonding agent must be well distributed over the surface of the sand grains in order to be effective; this can be accomplished only by thorough rubbing or mulling.

Green bond may be measured by several methods:

1. *Tensile Strength.* A specimen of sand is rammed up in a special two-part cylinder divided at right angles to its axis, and the force required to pull the cylinder apart is measured in ounces per square inch.

2. *Compressive strength.* A cylindrical specimen of sand is rammed up and broken in compression; results are recorded in pounds per square inch.

3. *Shear.* A cylindrical specimen of sand is sheared by applying a load along the axis; results are in pounds per square inch.

Tensile and compression tests on similar sands are almost proportional; that is, the higher the tensile, the higher is the compressive strength. This relation does not hold for sands differing widely in permeability. Very open sands are usually weaker in compression than tight sands of the same tensile strength.

Dry bond is the strength of a sand or mold after it has been dried or baked to remove moisture and harden the clay or other bonding material. Cohesion under such conditions is due solely to the close contact of the particles and this can be obtained only through colloidal bonding material. Hence, more or less sticky sands or organic binders must be used for dry sand molding. Dry bond varies with the moisture content of a sand when rammed, increasing as moisture is increased throughout the practical working range. It is measured by ramming up a cylinder of sand while tempered, drying it and then breaking it under compression. Dry tensile strength can be measured by making a briquet like that used in testing concrete and then pulling it in a tensile testing machine. Both tensile and compressive strengths are measured in pounds per square inch.

Gas Passes Through Sand

Permeability, also called openness and venting quality, refers to the rate at which gases can pass through the sand. Sand must be open enough to allow mold gases to pass through readily, otherwise blows, misruns and even dirty castings result.

In general, the finer the grain and the less uniform its size, the less open or permeable will be the molds made from it. On the other hand, fine grain produces smoother mold surfaces and smoother castings. Large castings and heavy sections require open molds, so if smooth surfaces are required, it is necessary to use a fine sand facing backed up with open sand, or else surface the mold with a wash. However, smooth mold surfaces alone cannot insure smooth castings as the kind of metal

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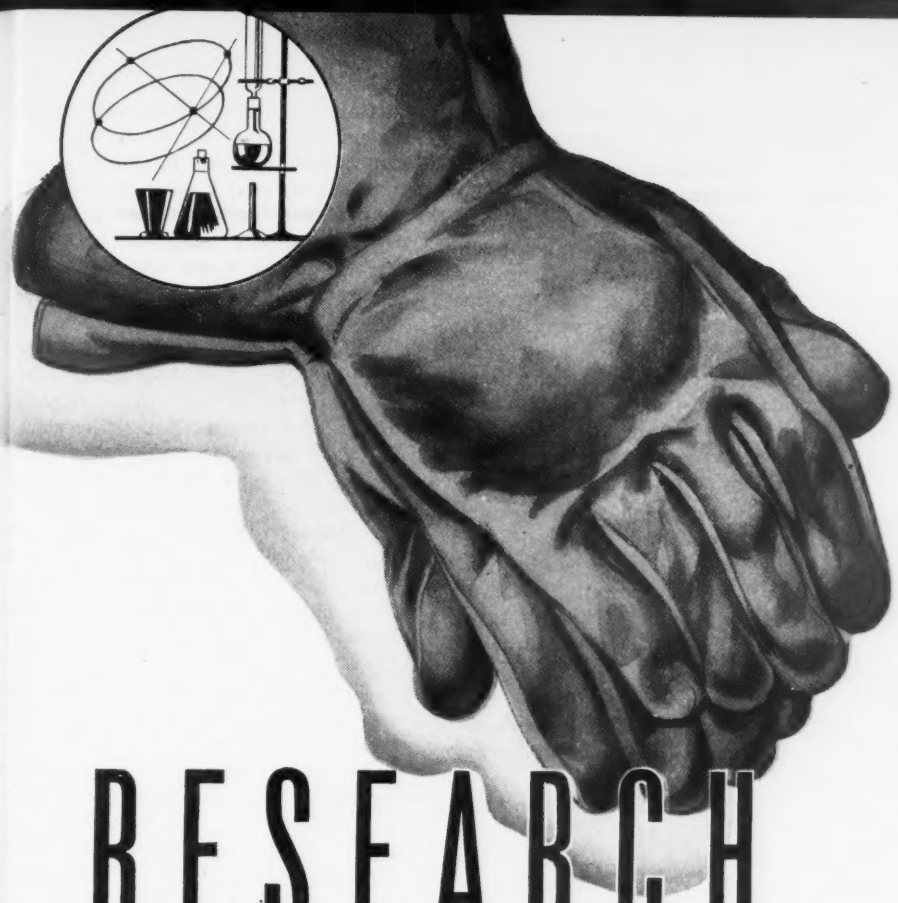

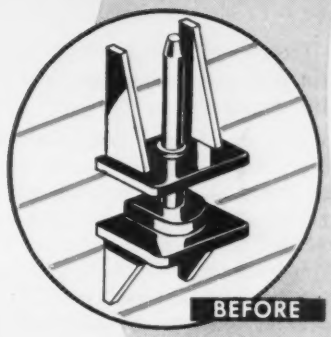

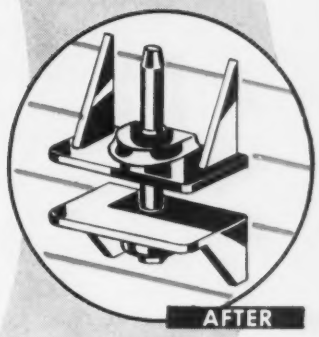

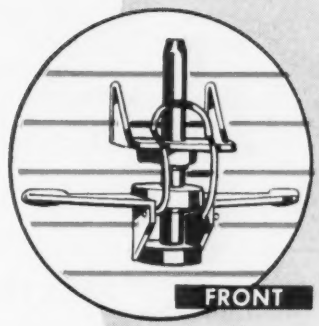

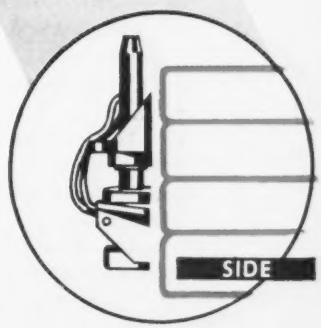

RESEARCH

that wears work gloves

Time and money-saving ideas don't always come from BS&B's ever-busy laboratories. The foundrywise workers who make BS&B Flasks developed these.

To provide more finger room and easier handling, note the new pinlug arrangement pictured at right above. Smooth, flat surface makes easier handling at the parting line of light-weight, one-man flasks.

Clamping spring (below) provides an automatic push-off arm for continuous line shakeout use. Both new features are optional . . . typical of BS&B's understanding of foundry problems, big and little.

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(*Concluded from page* 182)

and its pouring temperature are important factors.

Mold gases are from several sources. They consist of the air in the mold ahead of the molten metal; gas given off by the metal in cooling to freezing point and in freezing; water vapor from the moisture in the sand, and gases formed by the burning organic material in the cores and molding sand. The air in the mold and the gas given off by the metal must pass through the skin of the mold, through the sand, and out, or through vents made for that purpose. These gases are usually small in quantity.

Molten metal of good quality gives off very little gas in freezing, usually less than its own volume. Wild metal may give off as much as 1 cubic foot of gas per 100 pounds of metal. On the other hand, 1 ounce of moisture when evaporated produces about 1.7 cubic feet of steam, so that heat from the molten metal for a 100-pound casting may produce 10 to 20 cubic feet of gas from the moisture and organic matter in the cores and mold. If the cores and mold have the proper permeability, this gas need not enter the mold cavity but can pass off through the outer sections. Open flasks, perforated bottom boards, and artificial vents as well as open sand and cores promote the escape of gases.

Permeability is determined by clay content, moisture, and degree of ramming, as well as grain fineness. Sticky clay in low percentages tends to form tiny chunks when tempered and these open up a sand. Much clay and silt close up a sand. Sands with insufficient moisture are tighter than properly tempered sand; permeability increases with increasing moisture to a maximum value and then decreases. Excessive ramming results in a tight mold as well as a hard one.

Permeability is measured by ramming up a standard test piece of sand in a cylinder, then passing air through it under a definite, measured pressure. The rate of flow is taken as a measure of the openness of the sand.

Temper—Moisture content of heap and facing sand is a most important factor in the production of good castings. It is also most difficult to control because of its rapid change due to evaporation. Almost every other working property of molding sand is directly affected by temper. Plasticity, mobility, green and dry bond, and permeability all vary with moisture content. In green sand molds, moisture is the chief source of mold gas. In excess, water or wet spots in the mold cause the metal to boil, cutting into the surface and resulting in rough or dirty castings. It also hastens the cooling of the metal. It takes as much heat to vaporize the water in tempered sand as it does to heat the dry sand 300 or 400°F. This tends to make the metal less fluid and in some cases may cause misrun castings.

Moisture requirements of sands differ widely. Coarse-grained sands bonded with a low percentage of sticky clay require but little water, 1½ to 4 per cent. Fine sands and those containing much clay require from 5 to 8 per cent water and in exceptional cases 10 per cent. Organic binders also differ widely in this respect; some require much water to develop their maximum bond while others work better when fairly dry. Sand for dry molding is usually worked with more moisture than that for green molds; mold gas is not such a serious problem.

As a general rule, molding sand should be worked at the lowest moisture content that will yield sufficient bond strength for the job at hand. Uniform distribution of moisture through the sand is all important.

Moisture is measured by weighing a sample of sand, drying and weighing it again. The loss in weight is calculated in per cent of the weight of the sample.

Meetings of Interest to Foundrymen

Apr. 30-May 4—Material Handling Institute and American Material Handling Society, exposition and conference, International Amphitheatre, Chicago

May 4—American Association of Spectrographers, symposium, Society of Western Engineers Building, Chicago

May 18—Malleable Founders' Society, eastern sectional meeting, Hotel Commodore, New York

May 23-24—American Society for Quality Control, annual convention, Hotel Cleveland, Cleveland

May 25—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

June 4-6—French Foundry Association, foundry congress, Paris, France

June 11-13—Electric Metal Makers Guild, annual meeting, Seigniory Club, Montebello, Quebec

June 11-15—Conference on Industrial Research, Columbia University, New York

June 12-15—Institute of British Foundrymen, foundry congress, Newcastle-on-Tyne, England

June 18-22—American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hotel, Atlantic City, N. J.

June 22-23—Malleable Founders' Society, annual meeting, the Homestead, Hot Springs, Va.

July 27—Malleable Founders' Society, western sectional meeting, Drake Hotel, Chicago

July 30-Aug. 2—American Electroplaters' Society, convention, Statler Hotel, Buffalo

Sept. 10-14—International Foundry Congress, Brussels, Belgium

Sept. 10-14—Instrument Society of America, conference and exhibit, Sam Houston Coliseum, Houston, Tex.

Sept. 24-25—Steel Founders' Society of America, fall meeting, The Homestead, Hot Springs, Va.

Oct. 15-19—American Society for Metals, annual meeting and exhibit, Michigan State Fair Grounds, Detroit

Oct. 19-20—Texas Regional Foundry Conference, Texas Chapter of the AFS, Shamrock Hotel, Houston, Tex.

Oct. 25-26—Gray Iron Founders' Society, annual meeting, Edgewater Beach Hotel, Chicago

Oct. 31-Nov. 2—Foundry Equipment Manufacturers' Association, annual meeting. The Homestead, Hot Springs, Va.

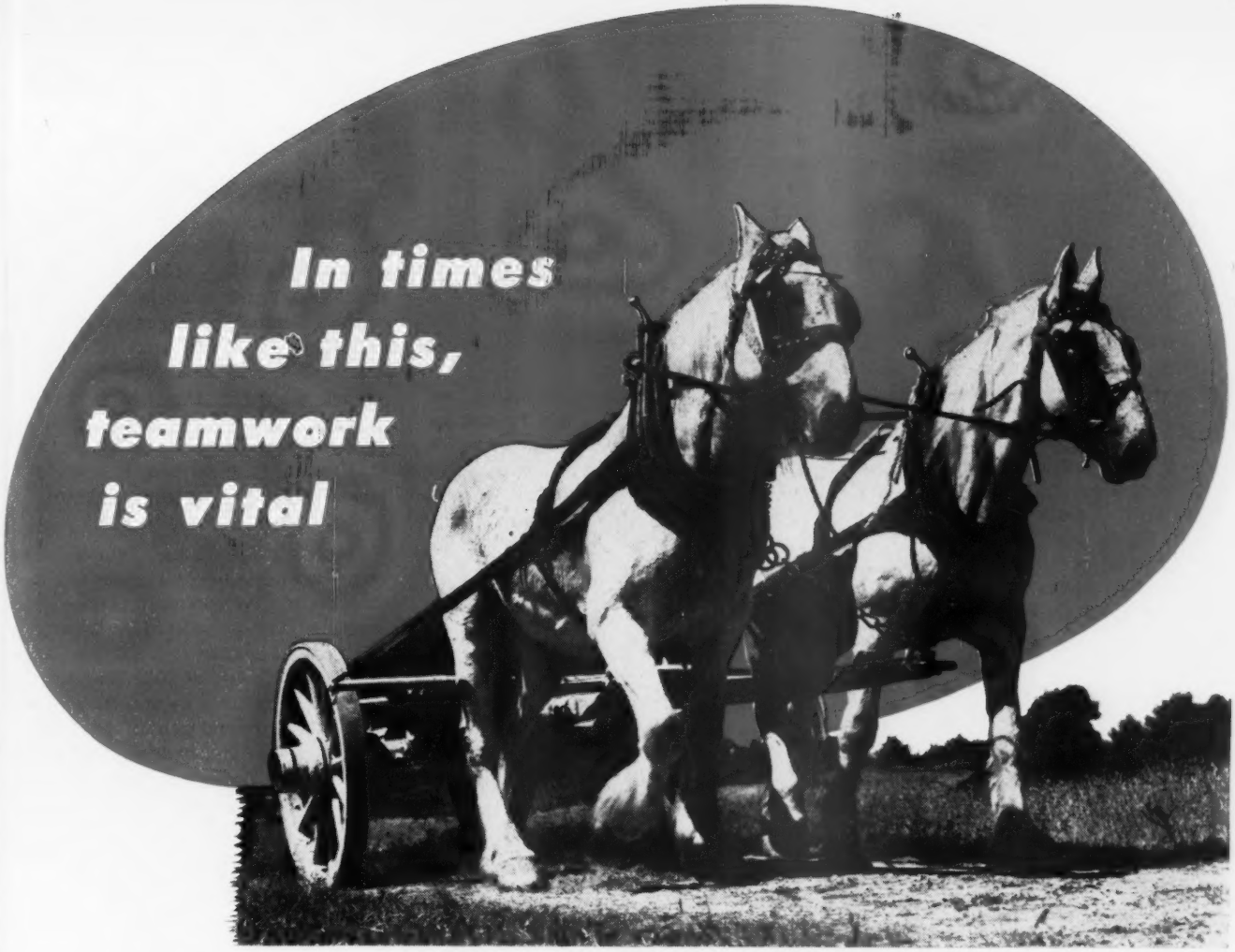
Nov. 7-9—Meehanite Casting Manufacturers, annual meeting, the New Yorker, New York

Nov. 7-9—National Foundry Association, annual meeting, Shoreham Hotel, Washington

Nov. 8-10—Steel Founders' Society of America, Technical and Operating Conference, Carter Hotel, Cleveland

Nov. 15-16—Magnesium Association, annual meeting, Biltmore Hotel, New York

Dec. 6-8—American Institute of Mining and Metallurgical Engineers, Electric Furnace Steel Conference, Hotel William Penn, Pittsburgh



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SAN FRANCISCO AREA—Pacific Graphite Company, Inc., Oakland 8, California.

LOS ANGELES AREA—Snyder Foundry Supply Company, Los Angeles 11, California.

MINNEAPOLIS AREA — Foundry Supply Company, Minneapolis, Minnesota.

MEXICO—Casco S. de R. L., Apartado Postal 1030, Calle Atenas 32-13, Mexico, D. F., Mexico.

SALES AGENTS, NO WAREHOUSES:

NORTHWEST AREA—E. A. Wilcox Company, Arctic Building, Seattle 4, Washington; Phone Mutual 1468.

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Ohio Ferro-Alloys Corporation
Canton, Ohio

Chicago Detroit Pittsburgh Tacoma Seattle
Minneapolis Birmingham San Francisco Los Angeles

BIRMINGHAM DISTRICT — Schuler Equipment Company, First National Building, Birmingham, Alabama.

Industry BRIEFS

CONTROLLED Castings Co., St. Louis, has been organized to operate a foundry business and has leased facilities there of the former George J. Fritz Foundry & Machine Co., 2018 South Third St. Harry H. Kessler, president, and R. Drant, vice president, of the new company are consultants to 37 foundries and originators of the Sorbo-Met process of casting. Modernization and expansion program involving $200,000 will include installation of new molding and melting equipment.

* * *

Frank G. Hough Co., 703 Sunnyside Ave., Libertyville, Ill., recently completed a building program designed to double production capacity for its line of material handling equipment. New facilities, including an assembly building 96 x 306 ft, and an office building covering 18,500 sq ft of floor space, were opened to more than 200 distributors recently at a new plant—new products show.

* * *

Altur Foundry Co., Clyde, N. Y., has been incorporated as a forging and foundry business with capital stock of $26,500. Directors are Peter Lucchesi, 159 Fall St., and Angelo Lucchesi, 81 Bridge St., Seneca Falls, N. Y., and Mario Riani, Clyde, N. Y.

* * *

American Machine & Foundry Co., 511 Fifth Ave., New York 17, has acquired Cleveland Welding Co., West 117th St. & Berea Rd., Cleveland, in a contract involving approximately $3 million. The latter company, in addition to bicycles, manufactures truck and tractor rims. Morehead Patterson is president of American Machine & Foundry Co., which is executing a large diversification program.

* * *

Electric Industrial Truck Association, 3701 North Broad St., Philadelphia 40, has changed its name to the Industrial Truck Association, and has opened membership to manufacturers of gas-powered industrial trucks and tractors. C. B. Cook, vice president-export manager, the Elwell Parker Electric Co., Cleveland, is president of the association, and Wiliam Van C. Brandt, Philadelphia, is secretary, treasurer and managing director.

* * *

Hanna Engineering Works, Chicago, manufacturer of hydraulic and pneumatic cylinders, valves and riveters, has completed 50 years of business. Founded in 1901 by Elmer Ellsworth Hanna, at 2059 Elston Ave., the company became incorporated in 1903. War production in 1917, forcing expansion to provide for additional facilities, occasioned purchase of the present plant at 1765 Elston Ave.

* * *

Western Foundry Co., 3634 South Kedzie Ave., Chicago 32, recently sold a portion of its property, at the southeast corner of 36th Place and South Kedzie Ave. The parcel, containing 159,000 sq ft of space, included several brick buildings of an abandoned plant last operated in 1946. Company will continue its foundry business.

* * *

John C. Kupferle Foundry Co., St. Louis 7, manufacturer of plumbing specialties, has moved from 2822 North First St. to 813-19 Hempstead St. where it will conduct a sales, shipping and receiving office. Foundry has moved its manufacturing division to Belleville, Ill. Leo J. Filstead heads the company.

* * *

General Refractories Co., Philadelphia, plans construction of a plant, to manufacture silica refractories, to be located on the Delaware river in Morrisville, Pa. The plant, part of a $12 million expansion program, will cost $3 million.

* * *

Cleco Division, Reed Roller Bit Co., Houston, Tex., has appointed Olson Equipment Co., 2930 Blaisdell Ave., Minneapolis, distributor of Cleco products in that area. Gil Boers Equipment Co., 7625 South Kedzie Ave., Chicago, and Airline Equipment Co.,

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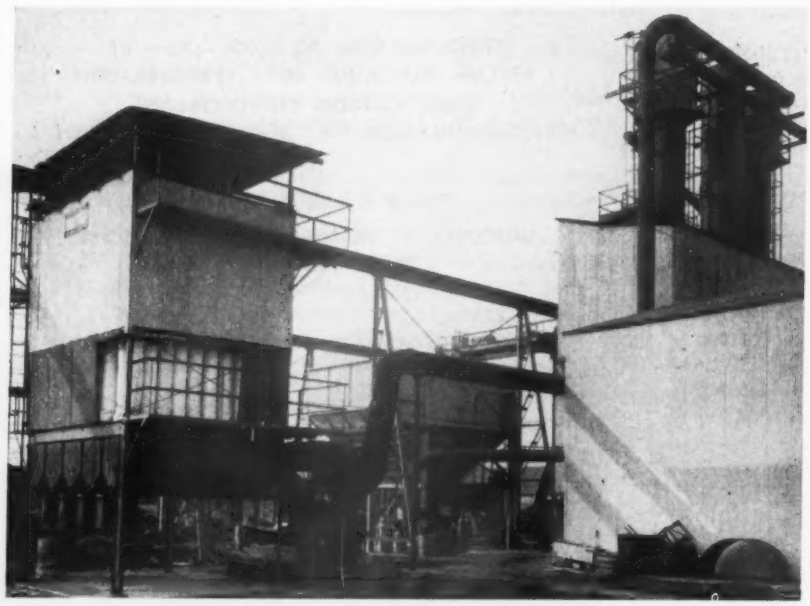
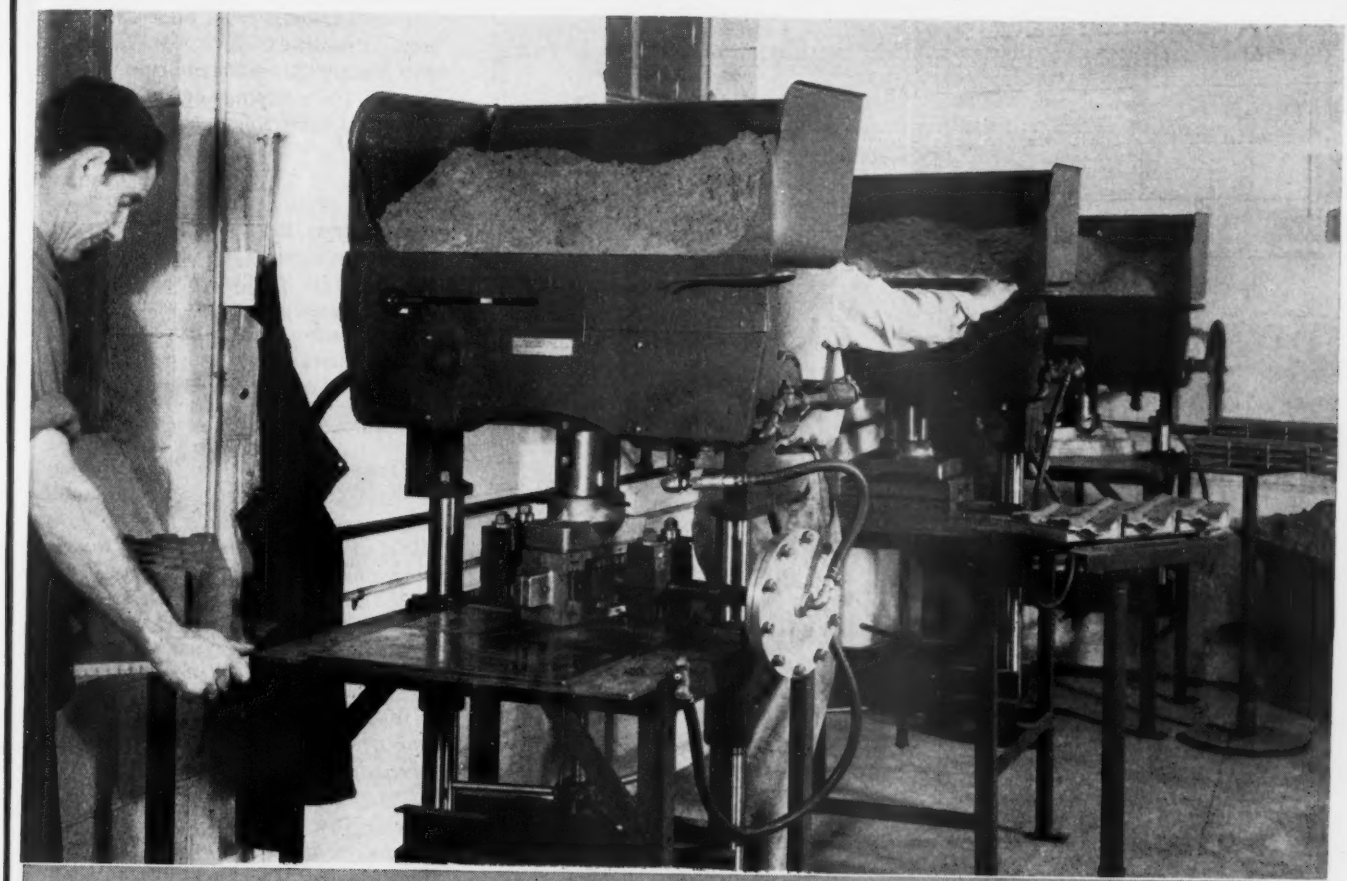
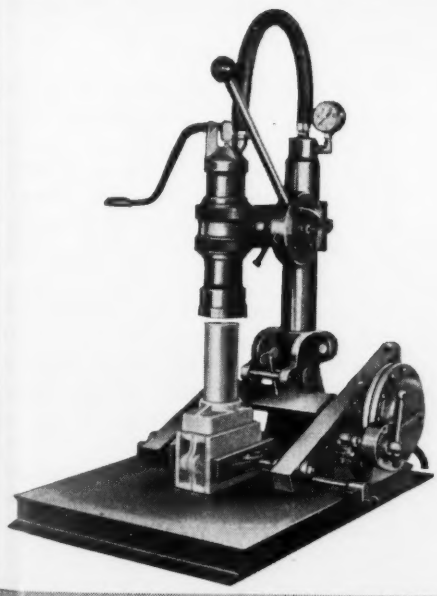


DUST SUPPRESSOR: Whiting Corp., Harvey, Ill., has developed a new bag-type dust collector for cupolas of General Metals Corp., Vernon, Calif., which is said to surpass requirements of the Los Angeles County Air Pollution Control District. All visible smoke and fume have been eradicated from the stacks. Shown above is the suppressor which serves two No. 4 cupolas equipped with conditioning chambers attached to upper stacks. Gases, dust, fumes and smoke passing through these chambers are directed to the new suppressor for final cleaning. Photo by General Metals Corp.



REDFORD *No. 2 Stationary Magazine Type* CORE BLOWER



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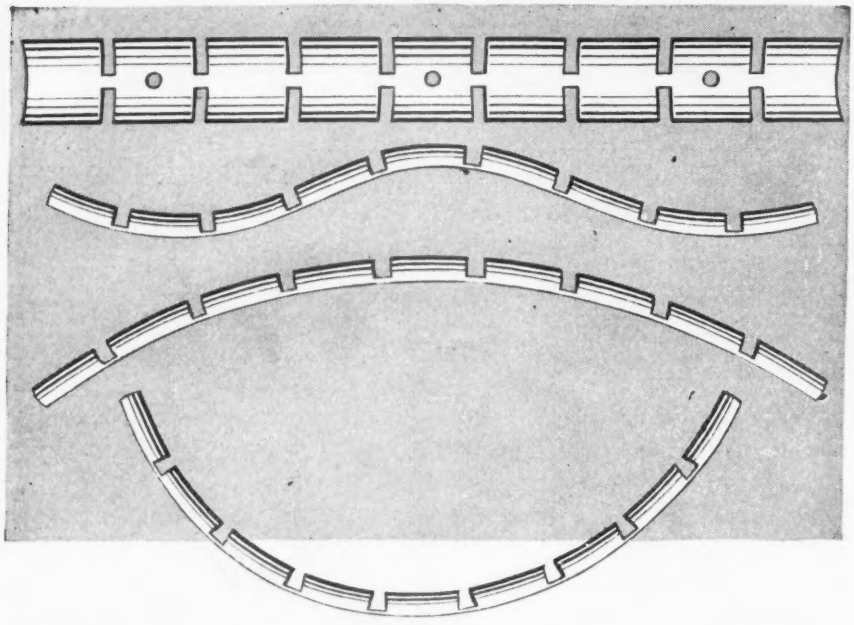
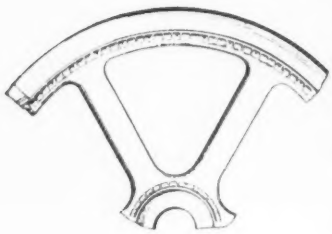
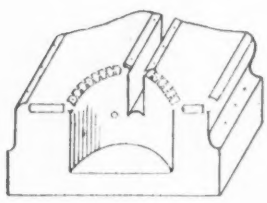


Take the CURVES in HIGH with MILWAUKEE (PATENTED) Adjustable Radius Chills



Adjustable Radius Chills used to chill rim-and-web and hub-and-web fillets in a gear casting.



Adjustable Radius Chills in a semi-circular fillet, in 2 sections.

Curved or irregularly shaped fillets hold no fears for foundrymen who have learned how to use these easily adjustable, extremely flexible radius chills to gain one or more of these advantages:

- Quick, easy, hand shaping to fit single or compound curves along the fillets of cores or molds for cylindrical, round or irregularly shaped castings.
- Effective chilling of hub-and-web and rim-and-web fillets of gears and gear blanks.
- Eliminate buckling . . . because the rows of evenly spaced slots provide "room for expansion" when the hot metal contacts the chill.
- Adjustable Radius Chills are easily broken at 1" intervals to accommodate curved or irregular fillets of any length.
- They effect substantial savings in welding and cleaning costs.

Send for Samples and see for yourself that MILWAUKEE Adjustable Radius Chills can bring you these benefits and more.

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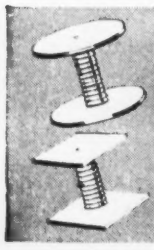

MILWAUKEE CHAPLET

(*Continued from page* 186)

2024 Frankford Ave., Philadelphia will handle Cleco distribution in those areas. Philadelphia office has been moved to 5200 North Fifth St., Philadelphia 20.

* * *

Alloy Engineering & Casting Co., Champaign, Ill., has begun rebuilding operations in its plant, destroyed by fire Mar. 10. Two of its three electric furnaces are being restored, temporary pattern shop has been set up and temporary cleaning room is functioning. Mrs. H. H. Harris is president.

* * *

Gnaedinger & Van Zelst Labquip Corp., Chicago, recently appointed sales agent for Tinius Olsen Testing Machine Co., Willow Grove, Pa., has announced change of address from 525 North Noble St., Chicago 22, as reported in the April FOUNDRY, to 4520 West North Ave., Chicago 39.

* * *

Foxboro Co., Foxboro, Mass., manufacturer of industrial instruments for measurement and control, has added a branch office at 618 West Church Ave., Knoxville 16, Tenn., under the managership of Marvin L. Cleaton Jr., formerly in charge of the Columbus, O., office.

* * *

Slinger Foundry Co., Slinger, Wis., maker of gray iron castings, suffered damage estimated at over $150,000, Mar. 30, when fire of undetermined origin destroyed half the foundry and cleaning room. Rebuilding operations have been started. M. O. Holtan is president.

* * *

Hall Foundries Inc., New York, has been incorporated with capital stock listed at 100 shares, no par value, for production of iron and brass castings. Directors are Beatrice Weiner, Irene Gershman and Stuart Z. Krinsly, 295 Madison Ave., New York.

* * *

Name of M. W. Warren Coke Co., 1525 Sublette Ave., St. Louis 10, has been changed to St. Louis Coke & Foundry Supply Co. There is no change in operation or personnel.

* * *

Sterling Wheelbarrow Co., Milwaukee, has changed address of its New York office from 25 West 43rd St. to 389 Main St., Hackensack, N. J.

* * *

Youngstown Alloy Casting Corp., 103 East Indianola Ave., Youngstown, O., maker of high-alloy steel castings, plans expansion of its new North Meridian Road plant there, to cost approximately $100,000. A 60 x 90 ft building, similar to one recently

completed, is planned to include a $47,000 electric furnace, core oven, sand mill, and other equipment. Jack Trantin Jr. is president.

* * *

Foundry building of Lansdale, Pa., plant of Hajoca Corp., Philadelphia, suffered damage Mar. 27, estimated at $10,000, when fire swept the second floor. Deems Hallman is general superintendent of the Lansdale plant of Hajoca Corp., which manufactures plumbing supplies.

* * *

Thiem Oil Co. Inc., West Allis, Wis., has been formed by Roger C. Minahan, Richard L. Greene, and John G. Vergeront, with capital stock of $25,000 to manufacture, sell and deal in foundry supplies, including but not limited to core oil and core washes, etc.

* * *

Cutler-Hammer Inc., Milwaukee, has opened a new sales office at 120 East Third St., Charlotte, N. C. Frank A. Miller Jr. and C. Lee Shaw will staff the new office, to be operated as a branch of the Atlanta district sales office.

* * *

B. C. Foundry has been formed by D. Birt and D. Y. Cadell, Guymon, Okla., to operate an iron foundry with capacity of 2 tons an hour.

Army To Exhibit Ordnance Items in District Offices

To aid industry, especially small business, in planning for military production, the Army Ordnance Department is setting up contractor exhibits at its district offices. Exhibits will include samples, display boards, photographs, and other essential manufacturing information pertaining to ordnance items.

Purpose is to offer small manufacturers an opportunity to examine representative component parts of standard items of ammunition and material for which they may have capacity to produce either as prime or subcontractors. Displays will be prepared by the purchasing offices and will be set up at the following district offices:

ALABAMA—734 Frank Nelson Bldg., Birmingham; CALIFORNIA—35 North Raymond Ave., Pasadena, and Oakland Army Base, Oakland; ILLINOIS—1660 East Hyde Park Blvd., Chicago; MASSACHUSETTS — Boston Army Supply Base, Boston, and Springfield Armory, Springfield; MICHIGAN—Fort Wayne, 6301 West Jefferson Ave., Detroit; MISSOURI —4800 Goodfellow Bldg., St. Louis.

NEW YORK—111 East 16th St., New York, and Sibley Tower Bldg., Rochester; OHIO—Big Four Bldg., Cincinnati, and 1367 East Sixth St., Cleveland; PENNSYLVANIA — Building 11, Frankford Arsenal Bridesburg Station, Philadelphia, and 311 Old Post Office Bldg., Fourth Ave. & Smithfield St., Pittsburgh.

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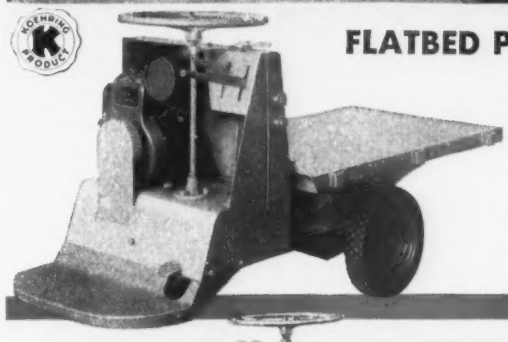
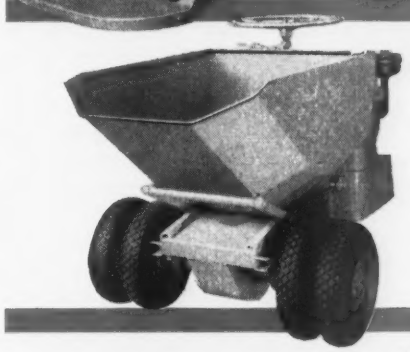
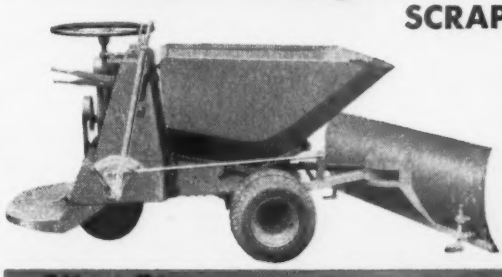
Moto-Bug
has adjustable FORK LIFT
With 4 interchangeable units, Kwik-Mix Moto-Bug makes man-hours more productive on all kinds of material-handling jobs. Fork Lift, hydraulic pump operated, transports pallets and crates . . . has adjustable-width forks.



FLATBED PLATFORM carries 1200-lb. load on sturdy 32" x 4 ft. bed. Platform tilts for easy pull-away when unloading . . . has stake pockets for adding sideboards. With full power forward and reverse, there's *"no push, no pull"* necessary to travel, back up, or spot.



10 CU. FT. HOPPER hauls coke, scrap, concrete and other bulk materials. Standard-make 4 h.p. gas engine takes full load up 20% ramps, grades. Operator rides on rear step. Plenty of traction and flotation . . . dual steer wheels standard, dual drive wheels optional.



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OHIO REGIONAL CONFERENCE

Treats Basic Foundry Problems

By EDWIN BREMER, WILLIAM G. GUDE and ROBERT H. HERRMANN
FOUNDRY

BASIC approaches to foundry problems constituted the theme of technical discussion at the fourth annual Ohio Regional Foundry Conference, held at Case Institute of Technology, Cleveland, Mar. 9-10. Approximately 235 Ohio foundrymen attended the meeting, which was sponsored by the Northeastern Ohio Chapter of the AFS and the institute, in co-operation with the Canton, Central Ohio, Cincinnati and Toledo Chapters.

An interesting and well diversified technical program was presented under the general conference chairmanship of S. E. Kelly, Eberhard Mfg. Co., Cleveland. Individual sessions covered malleable iron, gray iron, steel, nonferrous metals and pattern-making. One general meeting, two luncheon sessions and the conference dinner comprised the balance of the program.

Mr. Kelly presided at the opening general session at which visitors were welcomed to the conference by Dr. Elmer Hutchisson, acting president, Case Institute. The principal address was by Harry W. Dietert, Harry W. Dietert Co., Detroit, who discussed some of the basic fundamentals in foundry sand control. These included steps necessary to obtain the desired green, air set, dry and hot properties of sand mixtures. He urged elimination of the human element as much as possible in sand preparation, and recommended that each department be provided a plant practice manual detailing adopted practice.

At the first day's luncheon meeting George K. Dreher, executive director, Foundry Educational Foundation, Cleveland, answered the question, "Is This Where We Came In?" by detailing the important changes in foundry technology, capacity and public acceptance of castings since ten years ago when the nation's defense requirements also were expanding.

Fred J. Pfarr, Lake City Malleable Co., Cleveland, and Northeastern Ohio Chapter president, presided at the conference dinner. Brief talks were given by both top national AFS officers—Walton L. Woody, National Malleable & Steel Castings Co., and Walter L. Seelbach, Superior Foundry Inc., both of Cleveland. Major address was a thought-provoking discussion of national affairs by Col. Jack Major, Paducah, Ky. The conference was concluded with a luncheon session at which Henry Pildner, Station WGAR, Cleveland, discoursed humorously and played the piano entertainingly.

* * *

The first of four sessions on malleable iron topics had Ralph Hassett, pattern shop supervisor, Texas Foundries Inc., Lufkin, Tex., as speaker and R. H. Olmstead, Whitehead Bros. Co., as chairman. Mr. Hassett offered various recommendations on core blowing in a jobbing foundry. These covered such subjects as corebox design, location and size of blow holes, venting, location of coreboxes on the blower, and maintenance of boxes.

Duplex melting was discussed at the second malleable iron session by Fitz Coughlin Jr., Albion Malleable Iron Co., Albion, Mich. Joseph Dvorak, Eberhard Mfg. Co., Cleveland, was chairman. Mr. Coughlin described the type of equipment commonly employed, and recommended the establishment of standards for both raw materials and melting practice. A complete working manual should be prepared to outline departmental operating details, care of equipment, housekeeping rules, personnel responsibilities, etc.

Factors to consider in selecting a furnace for heat treating were detailed by Dr. Victor Paschkis, Columbia University, New York, at the third malleable session. These factors include: Uniformity requirements of the work, heating and cooling requirements, size and shape of the work and weight of the largest piece, size of the furnace, and initial and operating costs. He also discussed the different types of annealing furnaces and heating methods. On the subject of uniformity requirements of furnaces he pointed out that the only uniformity in temperature that matters is how close together are the temperatures of the surface and the coldest portion of the work piece. Dr. Harry A. Schwartz, National Malleable & Steel Castings Co., was meeting chairman.

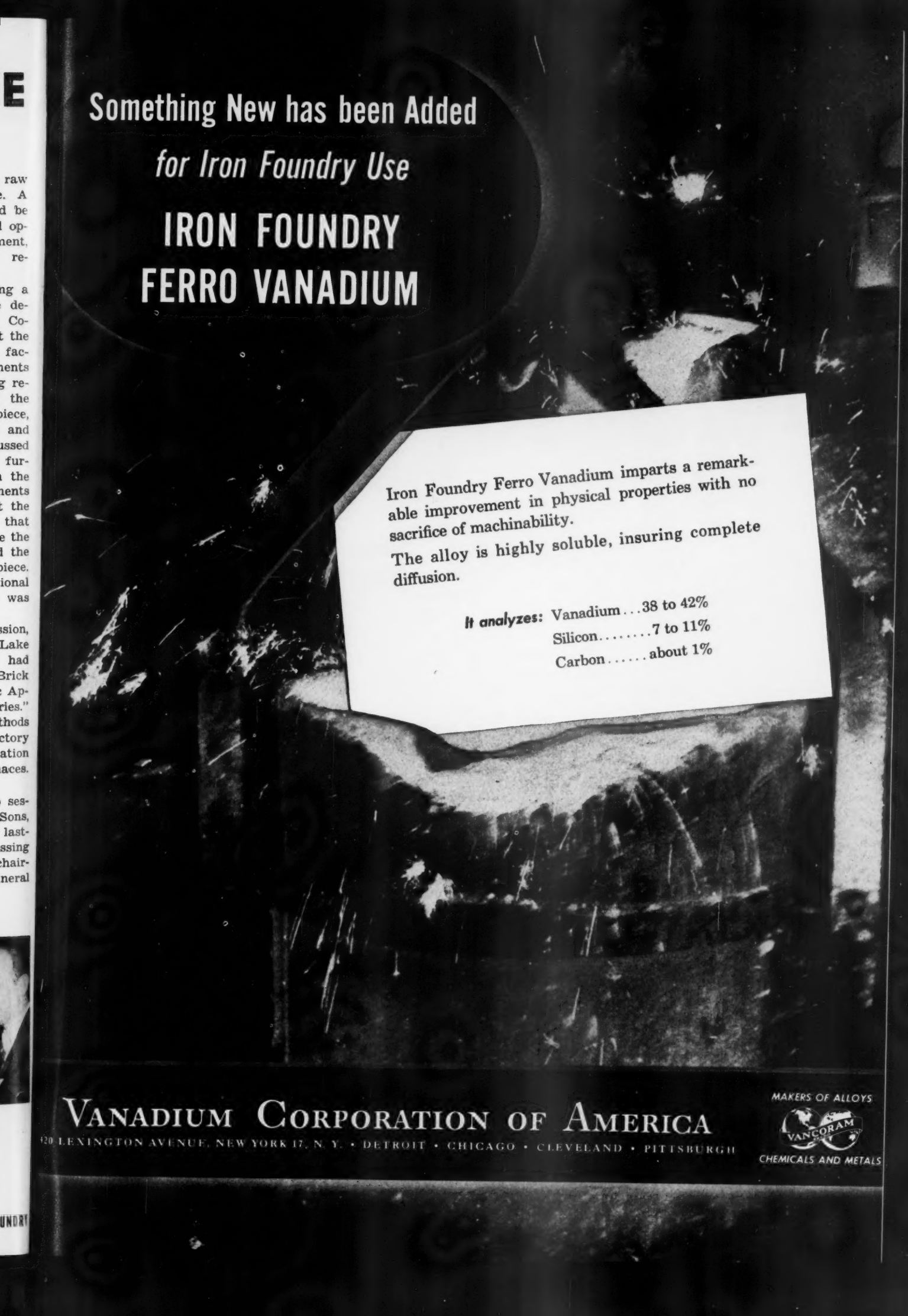
The concluding malleable session, presided over by John Manos, Lake City Malleable Co., Cleveland, had Ray Witschey, A. P. Green Fire Brick Co., Chicago, speaking on "Basic Approach to Malleable Refractories." Mr. Witschey described the methods of manufacturing typical refractory brick, their testing and application to malleable iron foundry furnaces.

* * *

Opening the nonferrous group sessions, William Ball, R. Lavin & Sons, Cincinnati, capably served as last-minute substitute for the missing scheduled speaker. With the chairman, E. C. Sawyer, Ayers Mineral

(*Continued on page* 193)

Shown at the conference, left to right, are: Walton L. Woody, National Malleable & Steel Castings Co., Cleveland, national AFS president; Fred Pfarr, Lake City Malleable Co., Cleveland, Northeastern Ohio Chapter president; Col. Jack Major, Paducah, Ky., banquet speaker, and a group of Danish visitors, here under ECA to study United States foundry operations. Photos at left and center are by Sterling N. Farmer, Sand Products Corp. Photo at right is by Tom Gallagher, Lake City Malleable Co.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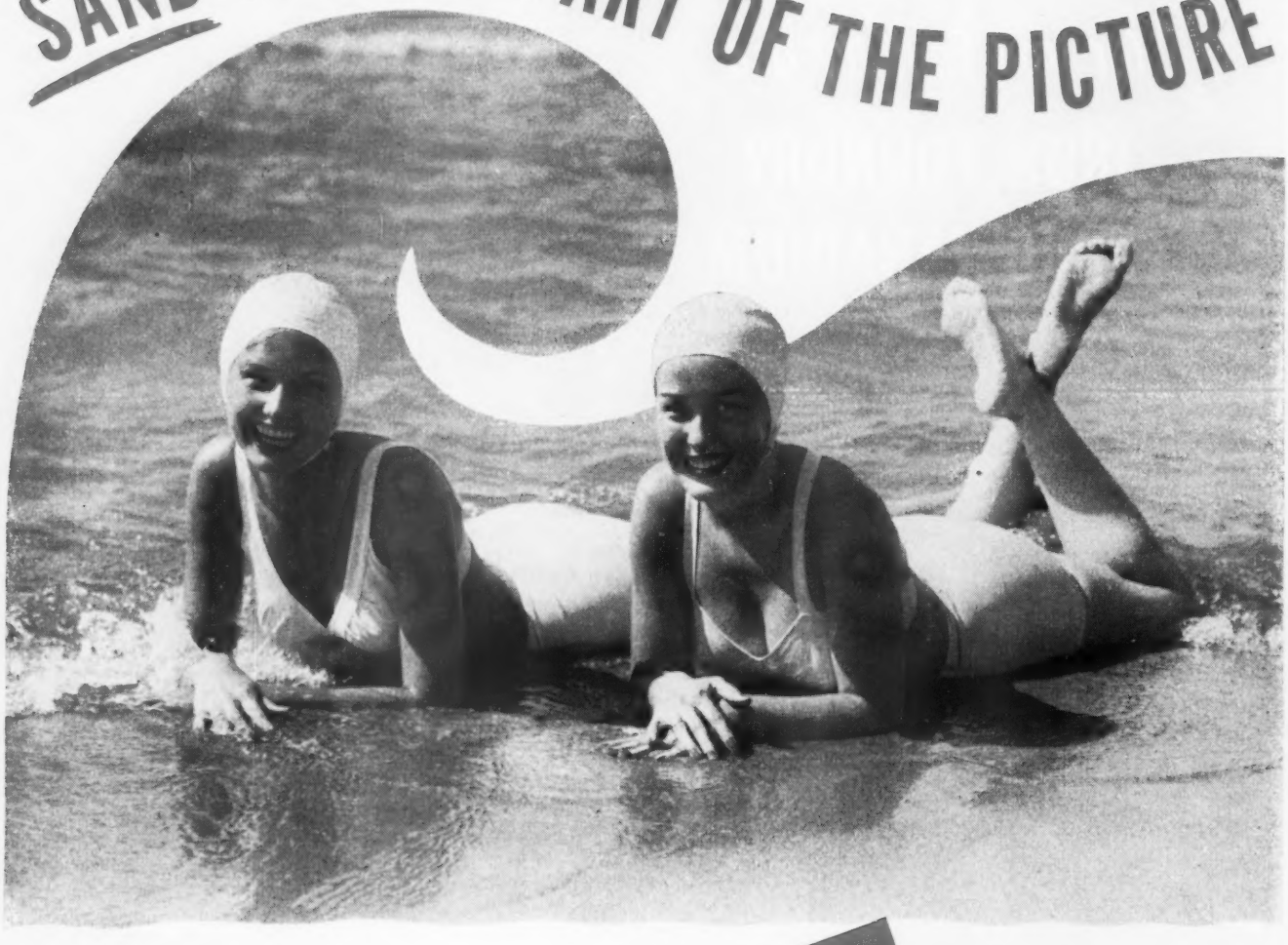
SAND IS ONLY PART OF THE PICTURE



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INDUSTRIAL OILS DIVISION . . . ROCKFORD, ILLINOIS

(*Continued from page* 190)

Co., Zanesville, O., he led discussion on various subjects relating to nonferrous foundry practice, with particular reference to sand. The succeeding nonferrous session comprised a discussion of magnesium foundry technology by W. C. Newhams, Aluminum Co. of America, Cleveland. E. J. Vargo, Wellman Bronze & Aluminum Co., Cleveland, was chairman. Mr. Newhams described numerous factors involved in the selection, melting and casting of magnesium alloys.

Aluminum alloy melting, handling and fluxing constitute the life blood in the production of good castings, according to William N. Brammer, Apex Smelting Co., Cleveland, who spoke at the third nonferrous session. Kenneth Stromberger, U. S. Reduction Co., Cleveland, was chairman. After describing the advantages and disadvantages of different types of furnaces employed, Mr. Brammer said that the alloy should be held at a temperature only slightly above that for pouring since high temperatures cause gas absorption, grain coarsening, and greater oxidation. Fluxing with solid or gaseous agents is a handy tool to be used when necessary, and need not be set up as standard practice on all alloys. Excessive fluxing is costly, and may have a harmful effect. Skimming should be conducted with care to prevent waste of metal and incorporation of inclusions.

William B. George, R. Lavin & Sons Inc., Chicago, was speaker at the concluding nonferrous session, with C. E. Eggenschwiler, Bunting Brass & Bronze Co., Toledo, chairman. Among various subjects relating to copper-base alloys, Mr. George discussed methods of arriving at prices of different types of nonferrous castings, and the proper procedure for making the most efficient use of pit type crucible furnaces.

First of the four patternmaking sessions had George D. Webber, president, Webber Gage Co., Cleveland, as principal speaker and Michael A. Horlak, Case Institute of Technology, as chairman. In discussing "Measurements and Their Importance to the Patternmaker," Mr. Webber spoke briefly on the history and development of measuring units. Gage blocks are true subdivisions of the standard yard and are today's standard of lineal measurement. They are used mainly to check measuring tools used in everyday work, although, in recent years, sets have been developed for shop use. Gage blocks are accurate to millionths of an inch, according to Mr. Webber.

Accuracy Is Important

He went on to say that precision manufacture is easier than nonprecision manufacture, mainly because the problem of parts assembly is reduced. Accuracy in patternmaking is important because of the need for producing accurate castings, which, in many cases, are to be assembled as components of complicated machinery.

"Design of Coreboxes and Driers for Use on Core Blowing Machines Including Size and Number of Blowholes and Vents," presented by Elmer Blake, Osborn Mfg. Co., Cleveland, was the subject of the second patternmaking session. Carl Winkler, Cleveland Standard Pattern Works, Cleveland, was chairman.

Mr. Blake showed slides of different types of core blowers and coreboxes. A number of slides showed a composite corebox, and the speaker explained reasons for the design, placement of blow and vent holes, and other features.

He stressed the necessity of good design, providing a corebox of sufficient strength to withstand high pressures developed during the blow, proper alignment of blowholes in the blow plate and corebox, parallel top and bottom sides, and placement of a majority of the vent holes in the upper half of the box.

With respect to driers, he emphasized the need for eliminating excess metal because of the current restrictions on aluminum use and the possible necessity of using iron. In conclusion, he advocated use of bentonite in core sand blowing mixtures to provide dry and green strength and thus eliminate, in many cases, strengthening wires and driers. He cautioned, however, that the use of bentonite reduces sand flowability somewhat.

Franz Schumacher, chief patternmaker, Cooper Alloy Foundry Co., Hillside, N. J., addressed the remaining two patternmaking sessions. His first subject was "Metal Spraying as it Affects the Pattern Shop." Ralph Whaling, P.M.S. Foundry Co., Cleveland, was chairman.

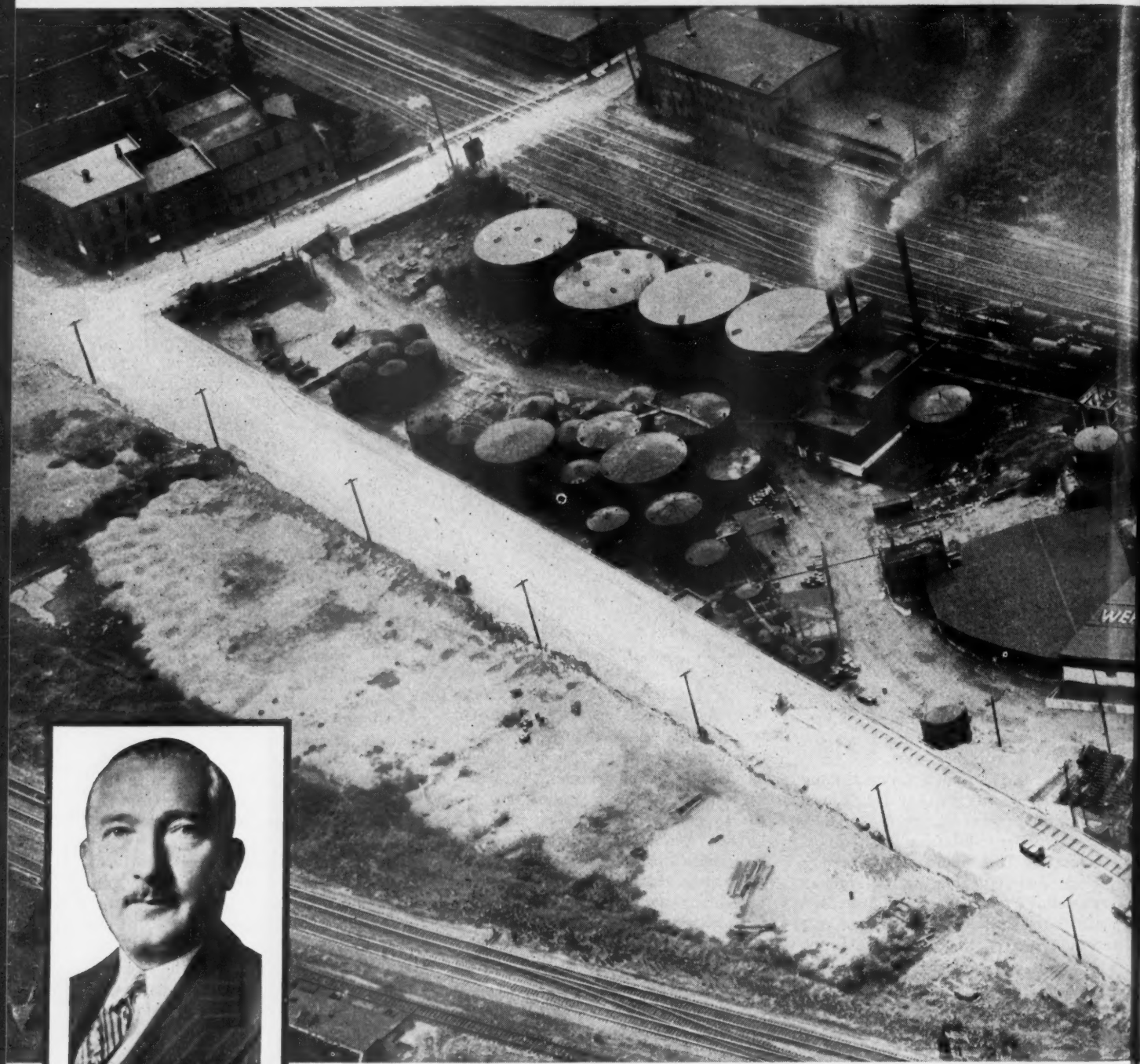
The speaker described a method of making a master corebox which is inexpensive and is said not to warp, shrink or expand, and to be unaffected by normal moisture. The process involves spraying a wood pattern, which has been coated with a parting compound, with molten bismuth metal, using a special spray gun. Cheese-cloth is placed on back of the metal coating; the burlap, dipped in plaster of paris, is placed on top of the cheesecloth. When dry, the sprayed-metal-plaster shell is removed and a sand mold made from it. An aluminum corebox is formed in the sand.

James J. Martin, Royal Pattern Co., Cleveland, was chairman at the concluding session at which Mr. Schumacher discussed "Plastic Matchplates." The speaker stated that plastic is stronger than wood and is subject to less surface wear

(*Continued on page* 196)

Left to right are: V. J. Sedlon, Master Pattern Co., Cleveland, national AFS director; S. E. Kelly, Eberhard Mfg. Co., Cleveland, general chairman of the conference; R. D. Walter, Archer-Daniels-Midland Co., Cleveland, conference secretary, and Walter L. Seelbach, Superior Foundry Inc., Cleveland national AFS vice president. Photos furnished by Sterling N. Farmer, Sand Products Corp.

Here's Our Plant Now Making T



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(*Continued from page* 193)

than aluminum. He described a patented matchplate frame having removable sections of plastic coated plywood. This frame was described in detail in February FOUNDRY, p. 194.

* * *

Of the four sessions on steel castings held during the conference, two were devoted to quality of steel for castings, one to knowledge about steel production, and one to risering. First session, Friday afternoon, was under the direction of T. W. Daniels, U. S. Steel Corp., Canton, O., and the speaker Charles K. Donoho, American Cast Iron Pipe Co., Birmingham.

In his discussion Mr. Donoho pointed out that steel melting proceeds in four stages—oxidation, recarburization and preliminary deoxidation, slag formation, and final deoxidation—and each step must be conducted properly to obtain a quality product. In the oxidation period best results are secured with a vigorous boil. Data indicated by the *P* factor (6000 times reduction of area plus tensile strength, divided by 5000) was highest with a manganese-silicon block. Slag fluidity ranged from 3 to 5 in. Steel is deoxidized with 2 lb Al per ton. However, with high Si up to around 1 per cent Al is not required to obtain sound castings poured in green sand.

Harold Templeton, Babcock & Wilcox Co., Wadsworth, O., was chairman of the second session. Clarence E. Sims, Battelle Memorial Institute, Columbus, O., discussed "Some Things We Know and Don't Know About Cast Steel." According to the speaker, the boil is the most important factor in melting since the agitation distributes heat uniformly in the bath, provides uniform composition, melts alloys better, and removes hydrogen and nitrogen. Removal of carbon at the rate of 0.4 per cent per hour is desirable. Steel slags are iron-manganese silicates or iron-manganese-calcium silicates, and their fluidity is dependent upon composition and temperature. FeO is the most important oxide in acid slag. Si in steel is a deoxidizing agent, and a minimum of 0.25 per cent is required—the range in cast steels usually being 0.30 to 0.45 per cent. However, when hydrogen content is high, a stronger deoxidant such as aluminum is required.

Close Control Necessary

Third steel session, with C. B. Williams, Massillon Steel Castings Co., Massillon, O., presiding, dealt with "Factors Affecting the Quality of Cast Steel." Thomas N. Armstrong, International Nickel Co., New York, was the speaker. Discussion was on steels which had to meet high ductility requirements and impact tests at low temperatures. For such steels it is necessary to use low-sulphur scrap, employ good furnace practice to hold gas absorption to low limits, follow good deoxidation practice, and maintain precise control of thermal heat treatment.

Final session on risering of gears was discussed by Robert Willey, Commercial Steel Casting Co., Marion, O. Michael Bock, Exomet Co., Conneaut, O., was chairman. Mr. Willey stated that the ratio of riser diameter to height is 1:1, and that the face of the gear is tapered 1 in. per ft as well as padded near the upper edge where the riser or risers are attached to provide directional solidification. From investigational work a formula was developed which works successfully: $D = 5/FR$ where D is diameter of the riser, and FR the freezing rate or SA/V. For example, in a simple ring gear with a width of 2½ in. and a 6-in. face, FR is 0.996 (no heat loss at junc-

(*Continued on page* 198)

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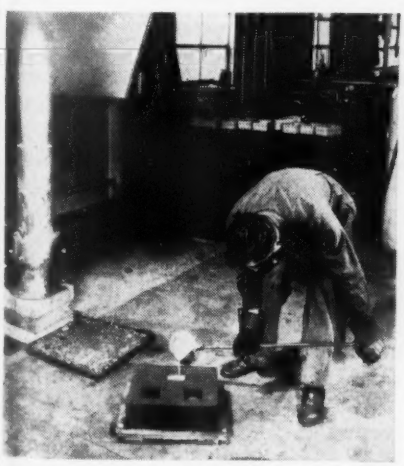
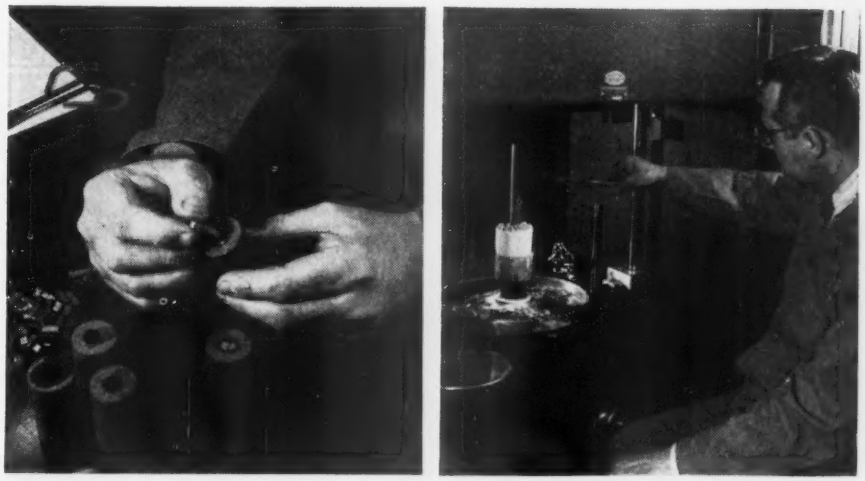


Small cupola used to simulate actual pouring conditions at The United States Graphite Company laboratory.



1⅛" cores with small cylindrical cavity being charged with metal (left) for insertion into the hot zone of the Dilatometer (right). Metal melts to form a small pellet. After cooling, the core and casting are studied for ease of removal, coating remaining, burn-in, and surface appearance.

MODERN LABORATORY DUPLICATES ACTUAL FOUNDRY CONDITIONS FOR BETTER PRODUCT RESEARCH

Old-time foundry men and newly graduated metallurgists alike who have visited The United States Graphite Company's neat, new foundry research laboratories in Saginaw have been enthusiastic about the completeness of the equipment, *the thoroughness of the tests*—and the extent to which the engineers here are going in order to develop even better Mexican Graphite products for America's foundries.

In this amazingly complete laboratory is a perfect little 4½" diameter cupola that exactly duplicates the results of its big brothers on production. An electric furnace and a Dilatometer are used to study the effect of temperatures up to 3000° F under just about any atmosphere. Metallurgical microscopes are used for closer study (up to 3,000 diameters) of the sand-metal interface of experimental cores and molds.

There is a core oven and complete sand testing equipment so that precise studies can be made of the penetration, effect on surface, and physical characteristic of sand when using various types of Mexican Graphite washes.

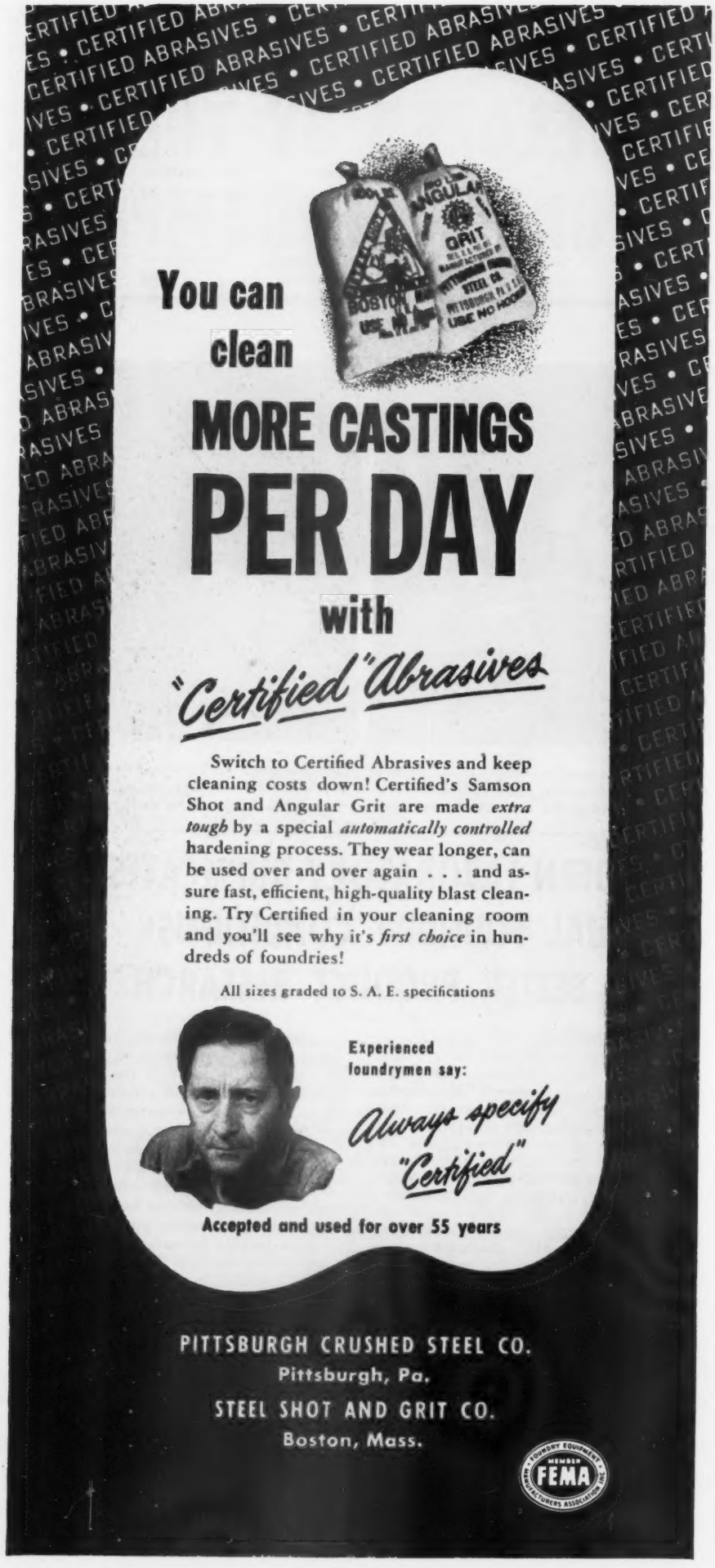
Within this modern laboratory there is even a chemical laboratory *fully equipped for making every kind of test and analysis* that is likely to apply to foundry products and foundry practice.

It is largely because of the completeness of this modern laboratory—and the skill, knowledge and creative ability of the engineers here that United States Graphite Company products are so effectively saving production time, cutting costs and helping to assure better castings in America's leading foundries today. *This laboratory is at your service.* Call or write us.

154-A

THE UNITED STATES GRAPHITE COMPANY

DIVISION OF THE WICKES CORPORATION • SAGINAW, MICHIGAN


You can clean
MORE CASTINGS PER DAY
with
"Certified" Abrasives
Switch to Certified Abrasives and keep cleaning costs down! Certified's Samson Shot and Angular Grit are made extra tough by a special automatically controlled hardening process. They wear longer, can be used over and over again . . . and assure fast, efficient, high-quality blast cleaning. Try Certified in your cleaning room and you'll see why it's first choice in hundreds of foundries!
All sizes graded to S. A. E. specifications
Experienced foundrymen say:
Always specify "Certified"
Accepted and used for over 55 years
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Pittsburgh, Pa.
STEEL SHOT AND GRIT CO.
Boston, Mass.
FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION
MEMBER FEMA

(*Continued from page* 196)

tion of riser and casting), and D is 5.1. For safety the riser diameter is increased ½-in.

* * *

At the first of four gray iron meetings, under the chairmanship of W. A. Kramer, the Advance Foundry Co., Dayton, O., Howard Wilder, Iron Foundry Division, Vanadium Corp. of America, Detroit, presented a paper on cupola operation in a permanent mold foundry. Metal is melted in three cupolas lined to 54 in. in the bosh and lined to 60 in. in the shaft. Each cupola is used in turn for 16 hours while the other two are being repaired. Melting rate varies from 10 to 18 tons per hour depending on requirements. Iron charge is 4000 lb; home scrap 1600 lb; steel varies from 150 to 800 lb; low-silicon malleable pig from 1000 to 1150 lb; high-silicon malleable pig 600 to 1100 lb; spiegeleisen or manganese briquets 25 lb.

Coke charges vary, depending on the number of permanent molds in operation. With 12 machines the coke charge varies from 450 to 540 lb, with 14 machines 400 to 480 lb; with 16 machines 400 to 460 lb, and with the maximum number, 18 machines, charge varies from 380 to 420 lb. Limestone varies from 60 to 70 lb.

Discussing blower capacity and performance the speaker commented that probably no item in cupola melting practice has been abused as widely as the air supply. Nearly all operators seem to feel that a little more air will melt more iron, even when the cupola is being operated to its theoretical maximum. In calculating blast requirements these factors should be taken into consideration: The quantity of fixed carbon in the coke and the chemical reactions taking place during melting. These reactions are not simple, but represent individual equilibrium conditions under dynamic and constant change, which create reactions that oppose each other. Other factors include coke size, nature of coke, height and temperature of bed at start, driving rate of cupola, burning rate and combustibility of coke.

Prefacing his remarks by an interesting biographical sketch Chairman Joseph Schumacher, Hill & Griffith Co., Cincinnati, introduced W. A. Geisler, research engineer, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., who discussed "Shell Molding," also known as the C or Croning process. Mr. Geisler was educated in Germany and was connected at times with various foundry firms in that country, includ-

ing the Krupp Works at Essen where he built and operated a large centrifugal foundry for casting sleeves up to and including 1200 lb in weight.

The Croning process was originated and developed in Germany. Essentially the process consists in forming a thin shell mold from a resin-bonded sand. Clay-free silica sand is used. Grain size will depend upon the surface finish desired on the casting. The general range is from 120 to 150, but it may be finer. Resin or bond content may be from 5 to 9 per cent. Several advantages claimed for the process include ability to produce thin sections, close dimensional tolerances, fine surface finish, freedom from surface flaws and high production.

Test Bar Merely a Tool

With Charles Burgess, Gray Iron Founders' Society, presiding at the third sesions, Dr. Richard A. Flinn, assistant chief metallurgist, American Brake Shoe Co., Mahwah, N. J., presented a paper on "Basic Relations Between Castings and Test Bars." According to the speaker the test bar merely is one of the tools employed by the foundryman. He knows what the tool is for and he knows how to use it for the purpose of drawing conclusions. He is familiar with all the variables which enter the problem. In many instances the designer and the engineer are not familiar with these factors or the influence they exert. For example, the designer specifies a tensile strength of 30,000 psi in a certain casting. He is satisfied when the foundrymen supplies a standard test bar which has withstood a tensile pull of 30,000 lb. He is not familiar with, or he overlooks, the fact that the strength of the bar is not the actual strength of the casting. The strength of iron in the casting will vary widely depending principally on section thickness and rate of cooling.

Fundamental factors in the design of a casting include quality, soundness, design, and internal stress. Contributory factors include resistance to shock, abrasion, high temperature, compression, corrosion and others. The speaker covered each item in considerable detail.

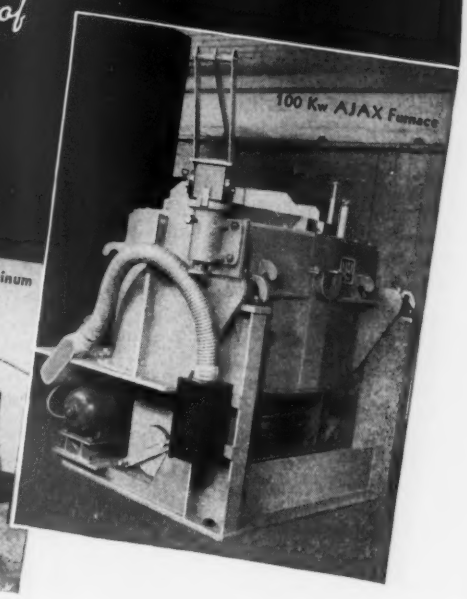
Ray Redmond, Buckeye Foundry Co., Cincinnati, presided at the concluding session where John B. Caine, foundry consultant, presented a lively comment on "Time—the Basic Foundry Problem." Mr. Caine stated that all, or nearly all, problems in the foundry are based on time, and the faster it goes, the greater the problem. On the subject of heat transfer with its many variables he stated the steel foundrymen have done more work, solved more problems and in general know more about thermodynamics than men engaged in other sections of the foundry field. He deplored the fact that while a great deal of valuable literature is available on the subject of thermodynamics in general and in its almost infinite ramifications, apparently it might just as well be written in the ancient language of Egypt, so far as the average foundryman is concerned.

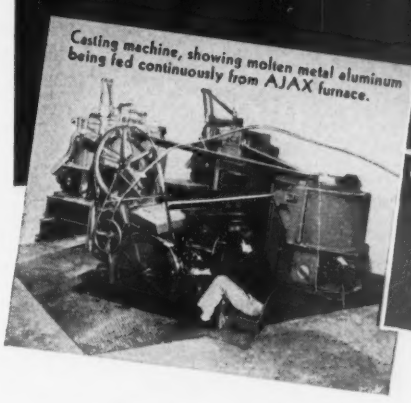
He concluded his remarks with the statement that many foundrymen refuse to read any literature on the subject of thermodynamics on the plea that the text is over charged with mysterious symbols. By some rapid work on the blackboard the speaker demonstrated that this is a lamentable and mistaken attitude. The symbols are few in number, easily memorized and merely constitute a form of shorthand.

Supreme Foundry & Mfg. Co., 800 Scheel St., Belleville, Ill., suffered fire loss of $25,000, Feb. 20.

AJAX - Induction Furnaces -

An Important Factor in Continuous Casting of Aluminum Rods





The picture at left above, taken at the Davenport, Iowa plant of the Nichols Wire & Aluminum Co., is a graphic example of the way in which AJAX furnaces are helping in modern methods of production. Three AJAX furnaces, two as melting units and the third acting as a holding furnace, feed a continuous stream of molten aluminum at automatically controlled temperature into a rim cavity on the slowly revolving wheel of the Properzi machine.

By this method scrap loss from pig to rod averages less than 1 pct., an extremely low figure, and all scrap is remelted, so that actually NO LOSS results.

The entire installation requires very little space. Working conditions are cleaner and cooler; the only heat is that generated within the melting metal itself.

Installations such as these illustrate the versatility of the AJAX furnace, which is doing so much to conserve manpower and reduce costs in these critical times.

Write For Further Information

AJAX ENGINEERING CORPORATION
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AJAX TAMA-WYATT INDUCTION MELTING FURNACE

AJAX ELECTRO METALLURGICAL CORP., and Associated Companies
AJAX ELECTROTHERMIC CORP., Ajax Northrup High Frequency Induction Furnaces
AJAX ELECTRIC CO., INC., The Ajax Hultgren Electric Salt Bath Furnace
AJAX ELECTRIC FURNACE CORP., Ajax Wyatt Induction Furnaces for Melting

Adventures of BILL

By PAT DWYER
Illustrations by RICHEY

I SUPPOSE," Bill said, "now that the tumult and the shouting have died down, you have received a flock of cards and letters reminding you of one thing and another and hóping that you will be present in your wheel chair when the Boys of The Old Brigade descend on the AFS convention in Atlantic City next year, like them there what-da-ya-call-'ems in purple and gold came down like a wolf on the fold. Think ya can make it?"

"Did you ever hear of the smart little boy who never crossed a bridge until he came to it? With your kind permission we shall let next year and its problems take care of themselves. Long ago I discovered that foundrymen hate to write letters. Maybe they are overly suspicious and hesitate at the prospect of putting anything in writing. It can't be that they do not know how to write. In the words of a moronic song that enjoyed a brief period of popularity years ago 'Everybody's doing it.'

"Look at some of the pitiful stuff in the lovelorn pages of nearly every newspaper. In suitable environment or in the presence of friends or enemies, or just casual acquaintances, foundrymen are as gabby as a flock of crows or magpies or seagulls, the greatest screamers of all. They know and freely make use of all the words, including several that the late Mr. Webster omitted from his well known and highly respected best seller. These are the words that never appear in ordinary publications. Well, occasionally a brave editor permits the insertion of a dash or two. The actual words are banned from all decent literature and appear only in really modern high-class fiction. In this way the lower classes—the ordinary people—are supposed to be protected from contagion.

"You might say there is apparent contradiction here in the well known fact that the high-class readers who know what the words mean, rarely use them. The lower strata of humanity, the proletariat, the run-of-mine people who picked up the words by ear and not by note, play them steadily, and as the fella says *ad nauseam* day and night.

"What prompted this comment is the fact that never—well, hardly ever—do I get a letter either of commendation or censure. I meet men here and there who admit that they read what I write. They never express these views in writing. Therefore you readily can believe I would be greatly pleased with a written communication. I also might say that in my well considered opinion I would classify the writer as a man of good judgment and nice literary taste.

"I don't know if the nonwriting habit is responsible, but the fact remains that I have not received a single comment, oral or written, on the subject of wrecked cupolas. As I mentioned in the article which appeared in FOUNDRY last November, the only other case coming to my attention was that described many years ago by the late master foundryman Robert Emmet Masters."

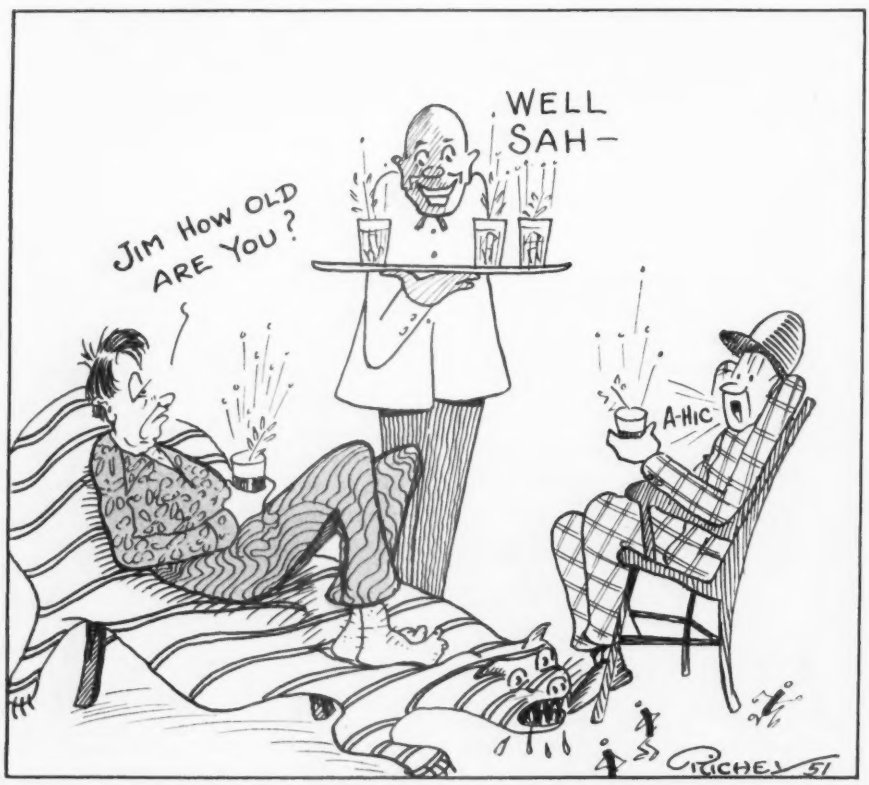
"Well," Bill interrupted, "I have here in my inside pocket, and presently will hold between the thumb and index finger of my right hand, a very fine exception that proves the rule you have just invented. Invented is good. You have used just about as many words as a modern inventor or his learned counsel uses in drawing up an application for a patent for a four-hole mouse trap, or a widdle-waddle for pumping the accumulated slush from the bottom of an old rusty swab pot. Want to hear the message?"

"Taking an underhand advantage of the sacred rites of hospitality. You know you have me trapped."

"Confucius say 'Fish who keeps trap shut, don't get caught.' At the recent AFS convention in Buffalo I met a very friendly lad from the West coast, where all the people are friendly. We soon discovered we had many mutual friends in that magnificent empire beyond the mountains. Among others he mentioned a recent arrival, my old friend Sam, a steelmaker from away back. As soon as he arrived home he said he would do himself the pleasure of calling on Sam. He also promised to write me an account of the interview. And here it is. Just cock your blinkin' ears in this general direction.

Dear Sir & Bro.: Following is an account to the best of my ability of your San Diego undercover agent in a recent interview. I have just come back—hic—from a chat with that alleged writer of—hic—foundry topics. Le's see, what's the name he goes by here? I got it. Never forget a name or a face—hic—Sam Robinson. That's the lad and do you want to make something of it? Do you have an annygoat or an anti—hic—antidote for three genuine Virginia

(*Continued on page* 202)

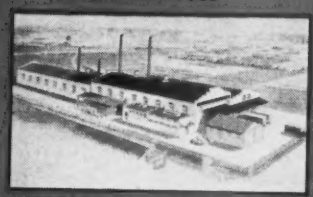


Relative strength of tiger milk and mint juleps tested by experts

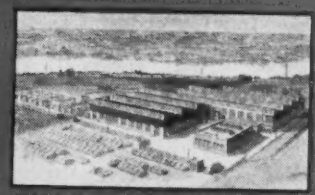
How Christiansen Corporation has grown to serve you

CHICAGO, ILLINOIS PLANT AND WAREHOUSE

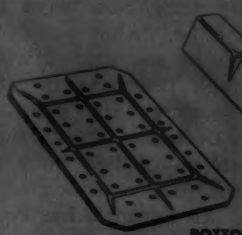
CHICAGO, ILLINOIS ZINC SMELTER



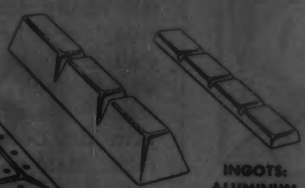
CHICAGO HEIGHTS ALUMINUM SMELTER



MAGNESIUM & STEEL FABRICATING PLANT

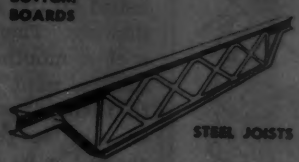


BOTTOM BOARDS



INGOTS: ALUMINUM ZINC BASE DIE CASTING

TRANSMISSION POLES



STEEL JOISTS

MARITIME GANGPLANKS

CASTINGS: ALUMINUM PERMANENT MOLD

HAND TRUCKS

GRAIN SHOVELS

BARREL SKIDS

DOCKBOARDS

Christiansen Corporation, and its subsidiary and affiliated companies, has for over a quarter of a century been active in development and progress of structural steel uses . . . aluminum and its general applications . . . and in magnesium production and fabrication from its inception in this country.

Since start of manufacture in 1914, its patented line of expanded steel poles, joists and other light structural steel building products has gained an international reputation. This expansion method of manufacture affords the lightest structure possible for equal strength.

Further product diversification, in line with the growing importance of "the light metal age", added production of non-ferrous alloy metals in ingot form as well as general magnesium fabrication and aluminum casting manufacture. Specific products for the foundry industry are Aluminum Alloy Ingot, Zinc Base Die Casting Alloys, and Magnesium Bottom Boards. Magnesium fabrication includes manufacture of such products as Dockboards, Maritime Gangplanks, Hand Trucks, Tote Boxes, Barrel Skids, and Grain Shovels as well as general fabricating work in the experimental, industrial, and military fields. Manufacture is conducted by use of all the modern equipment for complete fabrication work including the processes of deep drawing, forming, welding and joining.

Through its various integrated company operations, Christiansen Corporation is in a unique position to care for customer requirements. In purchase of its products you are assured of receiving continuous high quality of material designed or engineered for your specific needs.

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Plants • Chicago, Illinois
East Chicago, Indiana
Chicago Heights, Illinois

(*Continued from page* 200)

mint juleps? I mean with sprigs of mint in 'em?

I found Sam reclining on a tiger skin spread on the veranda floor of his hacienda in Coronado overlooking the silver strand and the broad Pacific. Quite an eyeful. I did not like to ask Sam if he had shot the tiger. I was afraid he might say yes.

Following the usual hearty greetings, Sam rang a very handsome little open-work hand bell. I suppose you know, and if you don't you should know, that in addition to its widely publicized weather, California has more bells, big and little, per capita than any other state in the Union. Father Prout, author of the famous "Bells of Shandon" would have rung himself dizzy if he had been fortunate enough to take a gander through California.

An ancient colored individual, the dead spit and image of old Uncle Remus, in a long tail coat and puce knee britches, shuffled onto the veranda with a two-handed tray bearing two crystal goblets containing the genuine Virginia mint juleps.

In his best hospitable manner and for my special benefit Sam said—as if he did not know "Jim, how old are you?"

"Boss," Jim made a respectful leg, "Ah wuz a good-size boy when Gen'l Grant done took Richmond."

It was quite apparent that Sam did not relish the historical by-path down which the conversation was drifting. He skilfully shifted the shovel from the right to the left hand. "Jim," says he, "where, when and how did you learn to make these here now superlatively excellent mint juleps?"

Jim modestly admitted it was a family secret. "Mah pappy wuz body se'vant to Gen'l Jeb Stuart. Man could he ride a hoss! Ah lea'ned all about mint juleps and lots of othah things f'om mah deah ol' pappy."

After he had shuffled off with the empty tray Sam says to me, "son," says he, "Ahm powe'ful glad y'all come to see me. I wish you would thank the boys in FOUNDRY office, Cleveland, for printing my yarn last December about alloy steel rolls. Mah public has been mighty patient and they will be glad to get the dope. All too little has been published on the subject of rolls and roll-making. Them there rollmakers are a close-mouthed bunch. Just like Jim and his mint juleps. Keep everything to themselves. All I have to say is they better get wise and creep out of their bomb shelters or the nodular iron boys will "mow 'em down!"

"Son, there are a lot of things an old timer could write about, but what's the use? As Bill has said many a time, the young fellas won't listen. They insist on making their own bull headed mistakes. I guess all men are like that when they are young and full of sheep dip, vinegar and quick silver. Churchill, Baruch, Hoover and I have found that out. And then again on the other hand, as you might say, I have known many old characters who never stumbled on the truth. They are as silly and opinionated at 60 as they were at 16.

"I mind the time 30 years ago I was running a foundry where we made the largest and heaviest centrifugal castings ever made any place before or since. The casting was a cylinder 46 in. diam, 26 ft in length and it took 30,000 lb of molten metal to pour one of 'em. The sweet running casting machine was a beauty. To hear some present day foundrymen talking about centrifugal castings you would be led to think they had invented the process. Do you know who put Bethlehem, Shenango and Watertown in the centrifugal game? Of course you don't. There are no

Want core plates that SAVE MONEY?

. . . then use TRANSITE CORE PLATES for easy handling, low maintenance, long life!

You get real long term economy with Transite* Core Plates. Their initial cost is low . . . and their maintenance cost negligible. Transite Core Plates are tough and corrosion-resistant. They are made from an asbestos and cement composition by a special Johns-Manville process. They resist shock and corrosion . . . will not crack or break easily.

Here are other important reasons for using Transite Core Plates:

THEY SPEED PRODUCTION— Transite Core Plates are easily handled. They're simple to clean, too, since core wash, sand, etc. do not adhere to them as readily as to other core plate materials.

THEY MAINTAIN ACCURACY— Foundrymen who have used Transite Core Plates for years report minimum warpage.

For cores of large mass and small surface area, perforated Transite Core Plates are also available to eliminate green cores and reduce baking time. For full details, write Johns-Manville, Box 290, New York 16, New York.

*Reg. U. S. Pat. Off.

Johns-Manville TRANSITE CORE PLATES

Made of Asbestos

patents or secrets any more. A good comprehensive history of the centrifugal casting equipment and methods would make an interesting story. Who would you get to write it? Even a more interesting query, who would publish it?

"Son, our young men are too provincial. They should learn what clever men are doing in other countries. I am ashamed to admit it, but practically every iron and steel manufacturing process we use came from abroad. Take a look at recent developements, nodular iron, basic cupola, new Belgian cupola, the shell molding process and many others."

Sam rang the bell for Jim who looked at me and inquired solicitiously, "Can I give you another julep?"

Well, Bill you know how it is. After one or two or maybe three—I kept no count—I bid Sam goodbye. Before long I am going back again. Sam promised to tell me all about the blast furnaces in the Old Dominion 50 years ago. I did not think his memory went back that far. However, on sober second thought it is quite probable that faithful old Jimmy with the coal black face and the white top head will be on hand with the tray, the crystal goblets and the Virginia mint juleps. Like the molders you refer to now and again some of these venerable and lovable old relics never die. They just disappear.

Bill folded the letter, put it back in his pocket and dragged out a second letter.

"Here," he said, "is an inquiry from a man who craves a little light on another foundry mystery. In keeping with the military spirit of the times I might inquire politely are you on the alert? O.K. Le's go:"

Every foundryman is familiar with the fact that pieces of cold metal—gates, sprues and scrap—will float when thrown into a ladle of molten metal. I never have heard a satisfactory explanation for this fairly common performance. The average foundryman accepts it as a matter of course. Pinned down by an inquisitive apprentice—occasionally one of these sharp little why-why-why lads is a thorn in the flesh—the party of the second part frames an answer according to his disposition, his digestion and the state of his mind at the moment. One man frankly admits he does not know the answer. Another man claims the boy will have to wait until he is out of his time before this top trade secret is revealed to him. A third man tells the boy it is all a matter of surface tension and porosity. A fourth man high up in the realms of pure science gravely informs the seeker after knowledge that metal floats as a result of molecular attraction, directional solidification, the war in Korea and the atomic dispersion of the inner lattice crystalline structure. The foreman kindly advises the boy to shut the noisy little trap under his beak, get

The KEY to LOW COST FOUNDRY SCREENING

with COMBS Gyratory FOUNDRY RIDDLES

- Screen
- Sift
- Mix
- Fluff
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(Illus. Type CS Riddle)

You can lock the door on high screening costs of moulding and core sands, medium fine and coarse dry materials when an inexpensive, efficient Combs Gyratory Riddle does the work of 20 men! A Combs Riddle—such as the type CS at left which automatically discharges gaggers, refuse, etc. costs less than 1c an hour for power to operate the 1/3 H.P. motor. The 24" square screens are quickly removable; the motor has completely enclosed bearings. Sturdy, compact, the Combs Type CS saves sand, saves time, saves man power. Only $320 f.o.b.

Type CR—24" round screen, without automatic discharge (screen removed, cleaned, replaced in 5 seconds) $310.

PROMPT DELIVERY FROM YOUR FOUNDRY SUPPLY HOUSE

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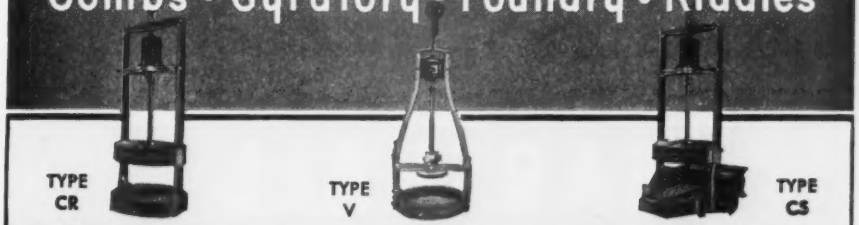
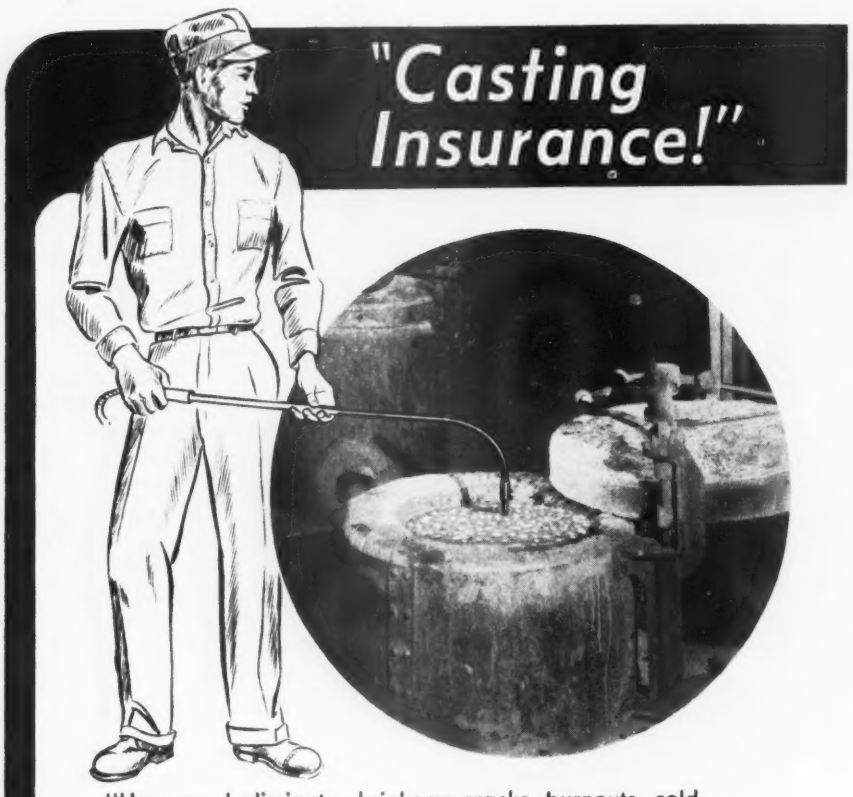


GREAT WESTERN MANUFACTURING CO.
LEAVENWORTH, KANSAS, U.S.A.

back to his floor and try to knock out a few good castings instead of the revolting miscarriages which now find their way either onto the charging stage, or into a ladle of hot metal, or—and here he gives the boy the eye—into the sand pile at the end of the floor. Since none of these reasons appeals to me I shall appreciate your opinion.

I wrote this honest truth seeker that my experience closely paralleled his in the litany of excuses offered by men in the shop to apprentices endowed with a natural and healthy curiosity. One more might be added to the list: Who wants to know? or What difference does it make? The stuff floats don't it? Watch out and don't throw in no wet stuff, an' be sure an' see your skimmer is dry and clean when you start dunkin.'

The best explanation and one in which I am inclined to agree appeared in FOUNDRY many years ago. All metals capable of being melted and congealed by a change in temperature are subject to the laws of expansion and contraction. During the process of melting iron expansion takes place in proportion to the heat up to the melting point. At this point the iron contracts more than it had expanded up to that point. This explains why cold metals and other substances float so buoyantly upon melted substances of the same composition.



"How can I eliminate shrinkage cracks, burnouts, cold spots and sand infiltrations, from my nonferrous castings," asks the modern foundryman.
Here is one way hundreds of foundrymen are doing it: they're keeping close control over their pouring temperatures with Marshall Enclosed-Tip Thermocouples! They're making certain that castings are poured neither too hot nor too cold!
Marshall Thermocouples aid you in making sound, machineable castings, with a minimum of rejects. They increase your output, decrease the scrap pile. Their use is "casting insurance". L. H. Marshall Co., 270 W. Lane Ave., Columbus, Ohio.

MARSHALL
THERMOCOUPLES

Melting Practices for Magnesium Alloys

(*Continued from page* 95)

sand removed. Some castings may require sectioning, and small-cored passages may have to be broken open to facilitate removal of core sand and sand blast sand. This prevents increase in silicon content and gas introduction known to result from certain core sands.

Operating scrap should be stored for as short a time as possible, to avoid the necessity for reblasting. Technical control personnel and furnace tenders should recheck such scrap before charging, to prevent the use of mixed or improperly cleaned material.

Ingredients of each charge should be weighed carefully and a complete record kept of the amount of each material. Although melting need not start from a heel, it is best to use a molten heel of at least 10 per cent of the pot capacity from the preceding melt to facilitate melting newly charged metal of the same alloy. Burning of metal during melting should be extinguished with flux, but indiscriminate use of flux should be discouraged.

The flux preferred for melting is Dow No. 230. Care should be taken to avoid using wet flux. This may be accomplished by keeping drums covered, especially during shutdown periods.

The metal should be charged according to a schedule, with the primary ingot and any metal for which composition adjustments are to be made added first. Operating scrap, which constitutes the bulk of the charge, should be added after the molten bath has been built up. Charging should stop when the level of the metal is 3 to 5 in. below the top of the crucible in order to avoid spilling during stirring and degassing. Adding operating scrap last makes it possible to control the composition of the melt. Care must be taken throughout the melting cycle to avoid charging any material which would tend to introduce gas or cause off-composition metal.

Upon completion of the melting operation, the metal temperature should be brought to between 1200 and 1250°F before the alloying materials, if necessary, are puddled in.

If large amounts of alloying materials are needed, they may best be added in a basket, but small amounts can be added with a hand puddler. If either magnesium or aluminum is required to adjust composition, the temperature of the melt during the addition must be maintained at approximately 1250°F. The beryllium addition should be made at this time, the amount added depending upon the charged components. A nominal beryllium content of 0.0002 per cent is preferred in the final alloy.

After all additions have been made, the melt must be stirred in a manner to produce a rolling motion to insure thorough mixing. Finally, the metal should be skimmed and chemical samples taken for immediate laboratory analysis. If analysis can be completed and the results reported to the furnace room before completion of the degassing operation, many difficulties can be eliminated.

Degas With Nitrogen

A metal temperature of 1220 to 1260°F is preferable during the nitrogen degassing operation and, in this temperature range, little difficulty results from burning. A suitable tube for introducing the nitrogen is a ¾-in. ID black iron pipe, which should extend within 6 to 8 in. of the bottom of the crucible or above the sludge line. A degassing cycle of approximately thirty minutes is sufficient for regular melts. The gas should be introduced at a rate which produces a good rolling motion but not violent enough to cause splashing. After degassing, the melt should be skimmed and covered with a thin layer of Dow No. 30 flux preparatory to transferring the metal into smaller pouring crucibles.

Proper choice of furnace and crucible is important in good melting practice. Crucibles of welded, low carbon steel, with a sprayed aluminum coating, have proved successful. Such pots of 2000-lb. capacity usually have side walls about 1¼ in. thick and a bottom about 1½ in. thick. During, and particularly after each melting operation, the sides of the crucibles must be scraped clean to maintain a proper rate of heat transfer. Sludge should be removed from the bottom of the pot to prevent formation of an insulating layer which would materially shorten pot life. Crucibles should be removed from the furnace at regular intervals for cleaning and thorough examination. It is well to clean the combustion chamber at this time to prevent build-up of iron scale and other debris which might deflect the flame against the crucible. This will help prevent serious fires if a crucible springs a leak.

After the initial melting is completed, the metal usually requires further treatment in preparation for pouring. For such treatment, the metal is usually transferred to smaller pouring crucibles. It is important that these crucibles be clean and preheated to prevent contamination and to eliminate any source of hydrogen gas from coming in contact with the molten metal. After being filled with metal, the pouring crucible is normally taken directly to a small furnace and brought to the flux refining temperature.

Flux refining is done between 1320 and 1360° by means of a mechanical or hand stirrer. A layer of Dow No. 310 flux is sprinkled on the metal surface and allowed to melt before the stirrer is used. Approximately 1 per cent flux by weight is usually sufficient. The flux should be added slowly so that it is fluid or pasty before being stirred under the metal surface. Here again, temperature must be controlled because higher

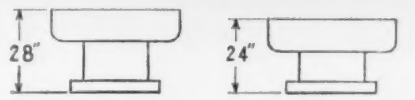
The Most Sanitary Washing Facilities Provide Extra Economies, Too

Group Washing

Bradleys have become the standard washing fixtures during the last 30 years. At the 54-inch Washfountain, 8 to 10 can wash, each provided with clean spray of running water. Foot-control and self-flushing bowl add to convenience and sanitation.

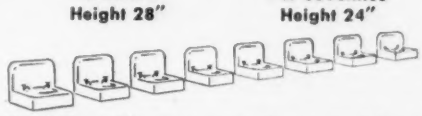
Correct Bowl Height

Face, hands, arms—even complete body to waist, can be washed as bowl is placed at 28" above ground. For juveniles as in schools or institutions, bowl is placed on shorter pedestal.



Standard Height 28" — For Juveniles Height 24"

Savings

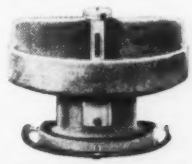


Water use reduced 70%. Only a bit more water is required for a group at a Bradley than for conventional "single-person" basin.
Only 3 Piping Connections to install for a group Washfountain as compared to 24 to 30 if same number (8 to 10) are served by "single-person" basins.
Less Janitor Time—no faucets—less piping maintenance.
Less Space Required.

A Choice of Types and Models

Bradleys are available in pre-cast stone, enameled iron and stainless steel—in full-circle 54" and 36" diameters and in semi-circular shape for mounting at wall.

Full-Circle 54" and 36" Diam.



Semi-Circular (Wall) 54" and 36" Diam.

And Duos—for your smaller washrooms

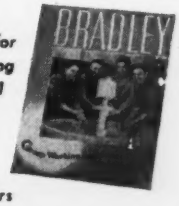
Foot-control, no faucets to touch or repair, no water waste—the maximum in sanitation.

When considering new, enlarged or remodeled washrooms—we can give you practical helpful suggestions. BRADLEY WASHFOUNTAIN CO., 2217 W. Michigan Street, Milwaukee 1, Wisconsin.

BRADLEY *washfountains*

Sold Through Plumbing Wholesalers

Write for Catalog 4701



temperatures will cause excessive burning and lower temperatures will result in improper melting of the flux. When flux refining has been completed, a thin layer of Dow No. 310 flux should be sprinkled over the surface of the metal. The stirrer should be removed and cleaned over a sludge pan.

In certain cases, the metal may require additional degassing at this point to reduce further the absorbed hydrogen. This degassing operation may be performed at a temperature between 1350 and 1380°F, using chlorine gas. The chlorine gas should be bubbled slowly through the molten metal until the hydrogen is removed. The chlorine should be introduced at a rate which will cause a slight rolling action on the surface of the metal, with little free chlorine being given off. This treatment has been found to be most helpful during periods of high humidity.

After degassing and before adjusting the temperature of the metal for pouring, it is common practice to refine the grain by one of a number of possible methods. The oldest method of grain refinement is to superheat the metal to approximately 1750°F. More recently, there has been considerable interest in the carbon inoculation method of grain refinement.

Among several ways of introducing carbon into magnesium alloys is the use of solid chlorinated hydrocarbons. Compared to superheating, this method saves time and materially increases crucible life. The use of solid chlorinated hydrocarbons for refining the grain of magnesium alloys is the subject of a patent application with allowed claims which will issue as a U. S. Patent within a few months.

Following the grain refinement treatment, the metal is adjusted to the desired temperature for delivery to the foundry and pouring.

Melting Practice Varies

Melting practice for purchased scrap and reclaimed chips and turnings has a few variations. One procedure used to reclaim chips and turnings is to first prepare a molten heel in the melting pot, using furnace heels and primary ingot. The molten bath should be fluxed liberally and the chips and turnings puddled in immediately to prevent excessive burning. To avoid high silicon content, the chips should be screened to remove as much sand and foreign material as possible. Blending primary ingot may also be used to reduce the silicon content.

A charge of this type in a 2000-lb capacity pot should be interrupted when approximately 1700 lb of metal have been melted. After thorough stirring, the melt should be analyzed and further additions made, if necessary, to complete the charge and bring the composition within the desired range. A check analysis should then be made before continuing the refining process.

The procedure for reclaiming mixed and dirty solid scrap from outside sources follows a similar pattern. Much of this scrap can be used in production without a preliminary chemical analysis. Sorting is generally possible by using cast-on specification designations, melt numbers and trade names, providing the scrap had previously been checked chemically to determine the alloy.

Aluminum scrap must also be separated. Attached nonferrous contamination, such as copper, brass and aluminum, may be removed by speed wrenches and chipping hammers. Ferrous contamination, which is easily removed, is usually taken off also. Oily or dirty scrap should be degreased before nonferrous contam-

For fast removal of sprues and risers from Bronze . . . Aluminum and Iron Castings!

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SWING FRAME

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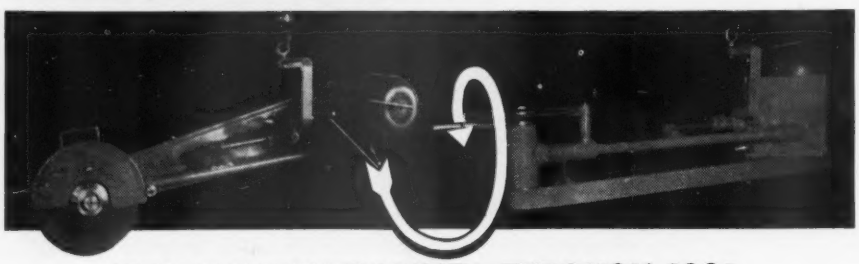

FULL MANEUVERABILITY THROUGH 180°

The new Fox Swing Frame Cut-Off Machines have been designed to take advantage of the new type "flexible" cut-off wheels. The machine has full maneuverability through 180°. It is especially recommended for the removal of sprues and risers from bronze, aluminum and iron castings.

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ination is removed. A degreasing operation consisting of steam cleaning with an alkali cleaner and solvent is usually sufficient. Exceptionally dirty castings may require sand blasting after degreasing.

Melting scrap is usually done in 2000-lb capacity melting crucibles. Cold or wet scrap should be dried before charging and, as a rule, more flux will be required than in normal melting. Degassing is usually required. A recommended practice consists of nitrogen fluxing, followed when necessary by chlorine for a shorter period after the metal has been transferred to the smaller pouring crucibles. The metal is then ready for use after the usual flux refining operation.

Mixed scrap may be melted in the same manner, but it must be analyzed and brought to proper composition before use. The percentage of off-composition melts following this procedure has been low.

The importance of a closely controlled melting operation, from the preparation of the original metal to the pouring of the metal into the mold, cannot be over emphasized. Good melting practice is of primary importance in the production of high-quality magnesium castings.

Officers Are Elected for International Committees

Officers of the International Committee of Foundry Technical Associations for 1951 are: President, Ir. F. W. E. Spies, Wenchebachstraat, 9, Velsen, N., Netherlands; vice president, Dott. Ing. Guido Vanzetti, Fonderie Acciaierie Milanesi Vanzetti, Via Nervesa 1, Milano, Italy. Announcement was made by Tom Makemson, secretary. Re-elected to offices of the International Committee on Testing Cast Iron are: President, Prof. Dr. M. F. Pisek, and vice president, Dr. Paul Bastien, Paris. Next meeting of these committees will be held in Brussels during the International Conference, Sept. 10-14.

Booklets Cover Selling To the Armed Forces

"Selling to the Armed Forces" and a companion guide, "How to Get Military Business," have been prepared by the Research Institute of America, 292 Madison Ave., New York. The directories contain an alphabetical listing of major articles being bought by military services and the offices that buy them, and provide a geographical guide to major purchasing offices throughout the country.

Procedures are outlined for establishing and maintaining contact with buying offices; negotiating, renegotiating and financing contracts; obtaining subcontracts; selling services; obtaining security clearance, and qualifying for 60-month amortization.

Book Review

Manual of Foundry Practice, by Prof. K. Gierdziejewski, 640 pages, 6¾ x 9¾ in. Price $3. Send requests to Penton Publishing Co., Cleveland.

Written in Polish, this book deals with foundry metal melting problems. It incorporates recent scientific achievements with the newest industrial practice. Two major sections discuss foundry raw materials and melting furnaces, covering ferrous and nonferrous branches of the industry. The text stresses theoretical examination of melting phenomena in order to induce the reader to assume an independent attitude in studying the problems.

Bailey

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For Ferrous and Non-Ferrous Smelters and Foundries

Ruggedly constructed for low-cost service, this machine is completely self-contained. If necessary it can be moved by crane and erected wherever needed. Once it is set in place, only an electrical connection is necessary for operation. The complete unit consists of the machine proper, motor, gear unit, variable speed reducer and drive.

CAPACITIES: 3 tons per hour to 50 tons per hour. 15 ft. to 100 ft. in multiples of 5 ft.

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Bailey Stationary Wheel design eliminates 80% of the moving parts of the conventional type. The moulds are supported by endless chains that run on top of idler wheels which are mounted at stationary positions along the strand.

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ENGINEERS

LEADERSHIP THROUGH QUALITY

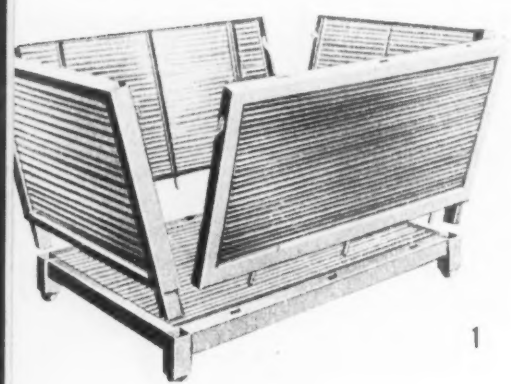
1221 BANKSVILLE ROAD PITTSBURGH 16, PA.

New EQUIPMENT *and Supplies*

For Additional Information on these Items Use Reply Card—Page 211

(1)—Box: Jervis B. Webb Co., 8933 Alpine Ave., Detroit 4—Knock-down materials handling box has patented nesting features which permit stacking of five or six loaded boxes safely. As many as three loaded boxes can be transported by fork truck at one time, it is claimed. When empty, the boxes can be disassembled so that ten units can be stored in the same cubic foot space required for four assembled boxes. In addition to use for carrying materials, the boxes can be utilized quickly to form storage bins, cabinets or shelves in a permanent manner and yet permit removal or transfer by fork trucks. Bayonet lock and dowel pins for the side sections permit easy access to the contents. Box is built in two sizes: One is 48 in. long with 27.5 cu ft capacity; the other is 54 in. long with 30 cu ft capacity. Boxes are constructed of square steel tubular frames, corrugated steel panels. They are accessible to eight-way pickup for fork trucks. Boxes also can be procured with wire mesh sides or canvas sides.

For More Details Circle No. 1—Page 211



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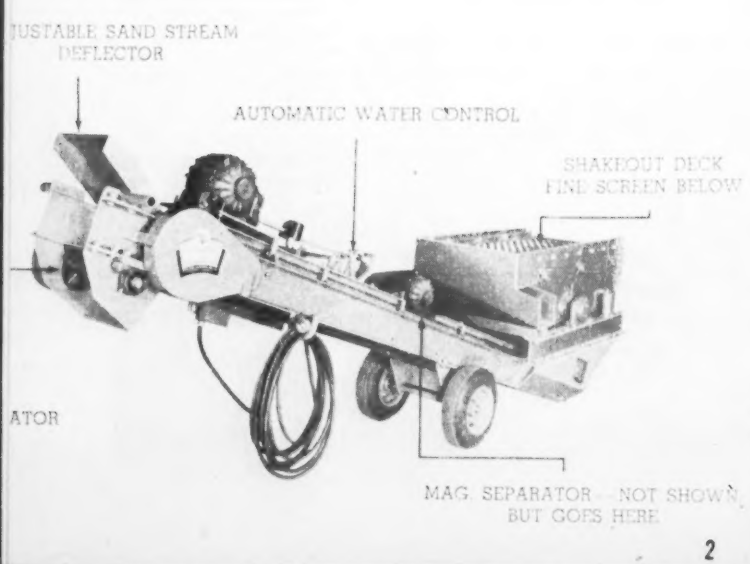
(2)—Sand Conditioner: Newaygo Engineering Co., Newaygo, Mich.—New machine is said to perform the complete shakeout and sand conditioning cycle without hand shoveling. Molds are dumped on the vibrating deck of the machine and the sand drops onto a vibrating screen where it is screened and tramp iron and core butts removed. It then travels on a belt conveyor past a magnetic separator (optional) where smaller metal particles are removed. Further travel carries it underneath an automatic tempering device which adds water uniformly. As the sand is discharged from the machine, a built-in aerator blends in the water, fluffs the sand and cools it. The shakeout deck is at convenient height for dumping the flasks. It can be used for mold sizes up to 20 x 30 in. and is said to handle up to 12 tons of sand per hour. Machine occupies 3 x 11-ft floor space.

For More Details Circle No. 2—Page 211

(3)—Hardness Tester: A. H. Co., Brighton, Mich.—Light-weight, precision made hardness tester is approximately the size of a slide rule (½ x 1½ x 8¾ in.). Tester is said to give consistently accurate hardness readings based on surface elasticity of the objects tested. In operation a simple hammer with non-elastic Carboloy tip is allowed to drop a determined distance to rebound to reading position. Conversion charts permit comparative Rockwell or brinell readings.

For More Details Circle No. 3—Page 211

(4)—Tractor Loader: Tractomotive Corp., Deerfield, Ill.—Tractor loader features a hydraulic torque converter drive and a new design clutch-type transmission which is said to eliminate most gear shifting. Two multiple disk clutches are used. One is for forward speeds, the other for reverse. Speed ranges are four forward and four reverse. Machine is mounted on rubber tires; has a ¾-cu yd, hydraulically controlled bucket, and weighs 10,650 lb. There is



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said to be ample bucket clearance and reach to load average size dump trucks. Power is by a 40.5-bhp gasoline engine.

For More Details Circle No. 4—Page 211

Vibrators: Spo Inc., 6448 Grand Division Ave., Cleveland 25—Air vibrators come in eight standard sizes and can be furnished with long stroke or with standard stroke piston to assure the correct intensity of transmitted power. Designed for operation on standard 80-psi line pressure, the vibrators may be used on hoppers, tables, molding machines, chutes and other types of production equipment. For hopper installations they can be used in conjunction with a quick-acting hopper gate valve which actuates the vibrator only when the hopper discharge gate is open. The vibrators are available in 2 and 2½-in. piston diameters. All models are tapped for ¼-in. rigid or swivel type, straight or ell connector for hose attachment.

For More Details Circle No. 5—Page 211

Paint: James B. Sipe & Co., Vanadium Rd., Pittsburgh 16—Rust inhibiting, synthetic primer which can be sprayed or dipped is intended for use on most clean ferrous or aluminum surfaces. Primer is said to bake or air-dry with equal facility, and it can be cured simultaneously with its top coat in a one-bake operation. A 15-minute baking at 300° F is sufficient for thorough drying. Ten minutes of air-drying is adequate to allow handling. Tests indicate that metal coated with the primer will withstand exposure well over a year without showing appreciable corrosion. Primer is available in gray, red, yellow, and black.

For More Details Circle No. 6—Page 211

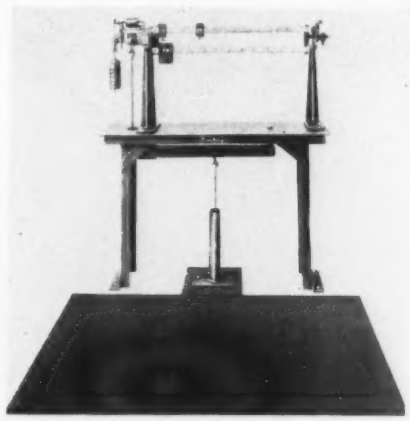
Recorder: Wheelco Instruments Co., 847 West Harrison St., Chicago 7—Electronically operated instrument is a deflection type strip chart recorder which provides up to six permanent records on one chart. Measurement may be obtained with sensing units producing electric signals, such as thermocouples, radiation detectors, etc. This deflection type system is a direct reading, nonbalancing method of detecting changes in a measured variable with accuracy to ¼ to 1 per cent of scale.

For More Details Circle No. 7—Page 211

Hoists: Wright Hoist Division, American Chain & Cable Co., 929 Connecticut Ave., Bridgeport 2, Conn.—Electric hoists, available in 250 to 1000-lb capacities, are light and well balanced. Hoists use two parts of 3/16-in. cable and have shaved gears. The lower limit switch is standard equipment.

For More Details Circle No. 8—Page 211

Platform Scale: Yale & Towne Mfg. Co., Philadelphia Division, 11000 Roosevelt Blvd., Philadelphia 15—Platform beam scale is designed for heavy-duty industrial applications where "shock loading" is the rule. The lever system in the platform is all steel as are other key parts.



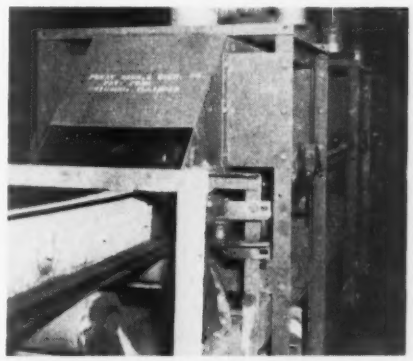
Poises on the main bar are mounted on roller bearings for rapid positioning. Platform is mounted on outboard bearings and absorbs the shock of moving loads without damage to the scale. It gives the same reading regardless of load location on the platform. Pit requirements for scale are 11 in. Scale is built in capacities up to 6400 lb. Platforms range from 46 x 38 to 76 x 54 in.

For More Details Circle No. 9—Page 211

Caster: Aerol Co., 2820 Ontario St., Burbank, Calif.—Heavy duty cast aluminum industrial caster has designed load rating of 2000 lb and accommodates an 8½-in. wheel which is said to withstand impact thrust loads of 40,000 to 60,000 lb. Unit uses a 1¼-in. chrome molybdenum steel permanently adjusted king pin. Lubricants are sealed in the hub and caster rig at the factory, and the seal is said to protect axle and bearings against foreign matter, including live steam under pressure.

For More Details Circle No. 10—Page 211

Sand Conditioner: Pekay Machine & Engineering Co., 100 North LaSalle St., Chicago 2—Sand conditioner is designed to be installed



at almost any point in an existing belt system without major rebuilding. Unit is about 24 ft long and 2 ft high. A number of features are claimed. Six-months' operation in one foundry showed the following improvements over previous sand conditioning methods: Output up 85 per cent; more flowable, lump-free and cooler sand; permeability increased from 100 to 110; green compression strength up for 10.5 to 12 lb; maintenance of correct moisture content, and one-half reduction of bonding material use.

For More Details Circle No. 11—Page 211

Wire Connections: Buchanan Electrical Product Corp., 1290 Central Ave., Hillside, N. J.—Solderless splicing and termination of electrical wires is achieved with splice caps and terminal lugs fastened to the wires with a special tool. Two sizes of splice caps handled most frequently use combinations of two or more wires ranging from two No. 18 to three No. 8. Snap-on insulators of fixed insulating value are said to eliminate necessity for taping joints. The hand-operated tool which installs both sizes of splice caps also installs terminal lugs on wire sizes from No. 16 to No. 8. Permanent connections of maximum electrical and mechanical efficiency are said to be obtainable on stranded solid or combinations of stranded and solid wires.

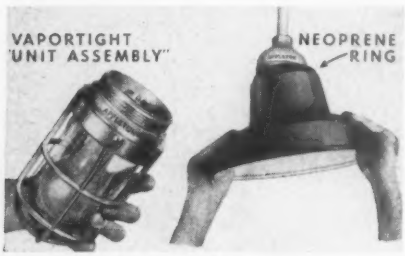
For More Details Circle No. 12—Page 211

Grease: Specialty Products Co., 190 Warren St., Jersey City 2, N. J.—Lubricating grease for use on plain or antifriction bearings is said to hold its lubricity and maintain adhesion at the highest temperature

where lubrication is required. It is a synthetic grease, containing no metallic soaps, fatty acids, filler, water or alkali. It is said to be completely stable under all conditions of service and storage.

For More Details Circle No. 13—Page 211

Light Fixtures: Appleton Electric Co., 1701 Wellington Ave., Chicago 13—New line of convertible



vapor-tight lighting fixtures includes 18 types of malleable iron fixture bodies for pendant, ceiling or bracket mounting. All bodies except bracket types are grooved to mount 100, 150, or 200-w reflectors in a choice of four styles—standard dome, shallow dome, deep bowl or 30 degree angle. Reflectors are steel with green baked porcelain enamel outside, white enamel inside. Receptacle assemblies and snap-on type guards are aluminum. Wireless spring leaf electrical contact between the fixture body and lamp receptacle permits receptacle with lamp, vaportight globe and guard to be unscrewed as a single unit, without tools, for relamping or cleaning.

For More Details Circle No. 14—Page 211

Flask Pins: Universal Engineering Co., Frankenmuth 4, Mich.—New line of threaded flask pins and bushings is designed for use in steel, aluminum, magnesium or other light metal flasks. They are precision machined, hardened, and ground for last-

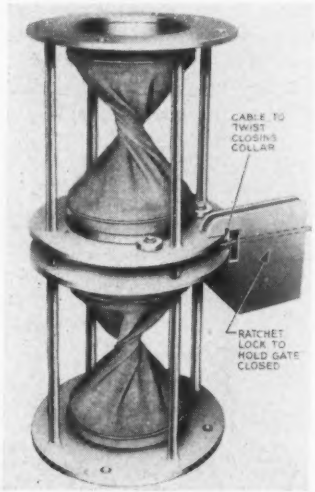
ing accuracy. Bushings are available in both round and elongated types; pins in both round and hexagonal types.

For More Details Circle No. 15—Page 211

Gear Motor: Sterling Electric Motors Inc., 5401 Anaheim-Telegraph Rd., Los Angeles 22—Slow speed (geared head) fan-cooled motor is equipped with a disk brake which can be supplied for either stopping or holding service. Both motor and brake are totally enclosed and dust tight, being designed for use in atmospheres containing nonexplosive dust, vapors, and other injurious foreign materials. The double reduction electric power drive is offered in ratings from 2 to 15 hp and AGMA speeds from 30 to 280 rpm.

For More Details Circle No. 16—Page 211

Bin Valve: Stephens-Adamson Mfg. Co., 100 Ridgeway Ave., Aurora, Ill.—Double closure bin valve consists of two rubber sleeves joined by a rotating steel collar. Dust and drip-tight closure is obtained by pulling on a cable wrapped around the rotating collar, sealing the opening



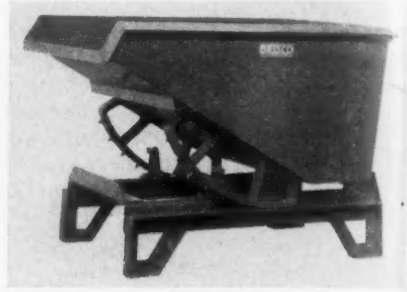
with a twist in each of the rubber sleeves. Elasticity of the rubber sleeves causes them to resume cylindrical shape immediately when tension on the cable is released. Since the flexible rubber sleeves can wrap themselves around lumps caught in the valve during closure, there is said to be no danger of leakage due to variation in material particle size. Valve can be hand controlled by a ratchet lock to hold the cable in the closed position. Valve also can be controlled automatically by a small actuating motor.

For More Details Circle No. 17—Page 211

Red Lead: John W. Masury & Son Inc., 1700 Bayard St., Baltimore 30—Red lead primer for metal is formulated of basic red lead and zinc chromate. Should there be a break in the red lead film, which sometimes occurs in handling, chromate ions are liberated over the break to protect the metal until that area can be touched up. The vehicle is moisture and alkali resistant phenolic. Made to be brushed or sprayed, the paint is red in color. It dries to the touch in 4 hr, hard overnight.

For More Details Circle No. 18—Page 211

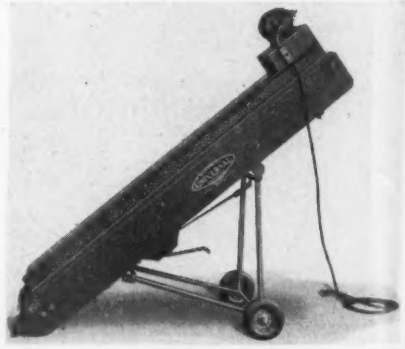
Dump Hopper: Brummeler Steel Products Co., 1415 Ionia Ave. S.W., Grand Rapids, Mich.—Self-



dumping hopper, designed for moving by fork or pallet lift truck, features an easy-to-operate release, which can be tripped from the lift truck. Hopper is constructed so the center of the load is located over the rocker. When the release is tripped the forward weight of the load automatically dumps the hopper. The empty hopper returns to normal position automatically. Hopper is available in capacities from ½ to 2 cu yd with dimensions of 26 x 44 x 24 in. to 51 x 71½ x 39 in. Hopper is of 3/16-in. reinforced steel plate; skid is heavy angle steel, and rocker is one-piece gray iron.

For More Details Circle No. 19—Page 211

Conveyor: Industrial Engineering & Mfg. Co., Brimfield, Ind.—Conveyor, specially designed for handling castings, is built with double bottom trough and heavy bar flights. It is available in four standard lengths—6, 8, 10, and 12 ft—with relative maximum elevations of 4 ft 6 in., 5 ft 8 in., 6 ft 10 in., and 7 ft 1 in.



Channel width is 15½ in. Steel flights are ½ x ½ x 10¾ in. riveted to No. 62 open-link steel chain with ultimate tensile strength of 4400 lb per chain.

(*Continued on page* 214)

IDEAS for FOUNDRYMEN

AVAILABLE FOR THE ASKING—This reader-service is designed to provide foundrymen with "idea" and reference material. Listings are selected from company product literature and reprints of special FOUNDRY editorial articles.

50. Mounting of Grinding Wheels

The Grinding Wheel Institute, made up of 30 of the leading manufacturers of grinding wheels, has data for you on the very important operation of the safe and proper mounting of various types of abrasive wheels. With wheel speeds what they are today, it is imperative that you know how to mount wheels the right way to get best results and also to avoid excessive wear and prevent accidents.

51. Vibrators, Feeders & Screens

Syntron Co. will send several bulletins on these important subjects. Controlled vibration at the right places can speed your handling processes, keep other equipment fully supplied with materials and aid in materials handling cost cutting. Ask for reprints from catalogs 501, 509 and 511.

52. New Brush Catalog

Osborn Mfg. Co.—76-page catalog No. 210 in color shows the right brush for the job—complete line of famous OSBORN brushes. Many illustrations show actual uses. You'll learn a lot about brushes and how their proper use can save you money!

53. Using Portable Tools

Rotor Tool Co. invites you to have this swell treatise on the use and selection of portable tools. Buffing, weld grinding, disk sanding, drilling, all-purpose grinding, honing, etc. Also gives tips on proper air pressure, air hose, etc. If you use portable tools, this is "must" reading! Also bulletin No. 35 beautifully illustrated catalog of company's line of air tools.

54. Melting & Holding Furnaces

Lindberg Engineering Co. offers bulletin No. 551 showing line of Lindberg-Fisher melting and holding furnaces for nonferrous metals such as copper, bronze, tin, aluminum, zinc, lead, nickel alloys, brass, magnesium, etc., in both gas and oil-fired models; motor and hand tilt; together with burners, blowers, linings, etc.

55. Metallic Cement Compounds

Smooth-On Mfg. Co. presents very interesting 40-page booklet on line of metallic cements for all types of metals and for use in foundries, plants, motor cars, boats, homes, power plants, etc. Uses and methods are illustrated and instructions given for using this wonder material.

56. Tellurium and Its Use

American Smelting & Refining Co.—Reprint from illustrated article by Dr. C. R. Austin of Meehanite Metal Corp. on use of this wonder metal in promoting chills on gray iron castings. You should know about it!

57. Core Truck, Racks, Barrows

Chicago Mfg. & Distributing Co.—A well-illustrated folder of literature on their equipment for the core room. Also clever hand chipping hammers, bottom boards, slip jackets, core trays, wood wedges and air separators. Necessary accessories, indeed!

58. Abrasive Belts & Disks

Michigan Abrasive Co. offers brochure on stock sizes, aluminum oxide, garnet, silicon carbide, emery, flint and lapping compound. Check this one for information on "Michigan Red Coat Abrasives". Shipments from stock.

59. Unusual Refractory

Babcock & Wilcox Co. gives outstanding qualities of B & W Allmull fused mullite brick, its analysis and statistics regarding its performance as well as the range of applications of this special refractory material. Special shapes and sizes. Also in grain form for ramming mix. Bulletin R-29.

60. Lift Trucks

Silent Hoist & Crane Co.—Bulletin No. 77 shows "Liftruk" being put through its paces. Gives complete specifications for the 5, 7½ and 10-ton sizes. If that's not large enough, will make your size to order.

61. Sand Reclamation Systems

Nichols Engineering & Research Corp.—Swell bulletin No. 222 graphically presents ideas on what can be done in your own foundry on saving vital materials.

62. Blows All Core Types!

Federal Foundry Supply Co.'s San-Blo core blowing machine is said to handle any sand mixture that can be hand rammed and, of course, do it far faster. It uses your present core box equipment; wood or metal; open, closed or split boxes. Bulletin CB-2.

Additional Information?

For additional information on any of the items described under "New Equipment and Supplies," "Trade Publications" or "Helpful Literature" in this issue—simply circle corresponding item numbers on one of these cards

5-51

FOUNDRY
Penton Building, Cleveland 13, Ohio

Please send literature or detailed information on subjects circled at left to—

NAME _____ TITLE _____

COMPANY _____

PRODUCTS MANUFACTURED _____

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Readers' Service Dept.

63. Payloaders

Frank G. Hough Co. has prepared series of bulletins on this line of materials handling, self-powered equipment all the way from ½ cu yd up to as large as you want them with four wheel drive! This is an expensive operation in any foundry.

64. Turbo Blowers

Allis-Chalmers Mfg. Co. in folder No. 16B6048A presents much data on their single stage turbo blowers, shows assembling and mounting photos and gives recommendations for adapting them to your blower needs.

65. Pyrometers

Pyrometer Instrument Co. will send catalog No. 150 showing line of quick-acting self-contained direct-reading pyrometers. Readings to 2500° F. Excellent for all nonferrous metals.

66. Crane Controls

Harnischfeger Corp. furnishes "a revolutionary new principle for AC cranes." It is called "Magnetorque" and is said to be the smoothest control ever devised for overhead cranes. Good layout of hoisting and lowering curves shows what can be done. This control really makes your cranes "talk!"

67. Refining & Desulphurizing

Mathieson Chemical Corp. can help in refining and desulphurizing cupola iron and has prepared folder to prove it. "Smooths out variations in cupola practice," they say and have compiled some very interesting data. "Purite" aids in doing this job.

68. Radiography a Foundry Tool

General Electric X-Ray Corp. has reprinted an article which is of more than passing interest to foundrymen and explains this subject in plain "sand rat" language. In addition to overcoming much of the misunderstanding and actual fear when this subject is mentioned, it points out the benefits of this method of casting inspection. It will be sent free and should be "must" reading.

69. Foundry Riddles

Great Western Mfg. Co. offers folder and data sheet on line of motor driven gyratory foundry riddles, sieves and rims. These riddles handle more sand and do a better job than up to 30 men could do by hand. Save your manpower to use elsewhere and let "Combs" riddles comb your sand pile!

70. Hoisting Equipment

David Round & Son has excellent series of bulletins, all in special binding, giving complete data on line of hand hoists, electric hoists, cranes, winches, trolleys and all accessories including hoist chain. Catalog No. 81 is the reference.

71. Jolt Pin Lift Molders

SPO Inc. has new bulletin No. 30 which fully describes their pin lifters having jolt capacity from 750 to 4000 lb and accommodating any type or size flask within these capacities. Dimensions, capacities, pattern draw, vibrator size and other data are given for quick reference. Table width is from 23 to 44 in.; length from 27 to 51 in. with 8, 10 and 12-in. pattern draw.

72. Flask, Boards & Platforms

Truscon Steel Co. shows line of pressed steel flasks in many weights and sizes including round flasks, square flasks, bottom boards and core plates, bands and bars, skid platforms and boxes. Durable, long life and nonwarping. Send for it!

73. Dust Control

American Air Filter Co.—Bulletin No. 277A. Roto-Clone type N Hydro-Static Precipitator. Describes operating principles, performance characteristics and much data on what this equipment could do in your foundry. Other items of company's line shown on back page.

74. Dock Boards

Rowe Methods, Inc.—Booklet on their "Adjust-A-Docks" for fast, efficient loading and receiving at docks and platforms. Adjusts hydraulically to exact height back of truck or into freight car. Eliminates the wasteful, damaging "bump" unloading which causes so much claim expense.

IMPORTANT READING FOR FOUNDRYMEN
We have a limited quantity of the following reprints which we can furnish while they last.

75. Mobilization Planning

Your company and the national security would benefit if each foundry would prepare a mobilization plan. You would then have the picture of how your facilities and personnel could contribute to the defense effort.

76. Foundry Accounting

Reprint entitled "The Accountant Reports to Management" by a well-known cost accountant. Eight pages of sound ideas and working suggestions for competent and accurate accounting in your own foundry.

77. Anthracite for Cupola Fuel

This should be of great interest as supplies of coke get tighter. The author recommends varying quantities of anthracite for substitution of your usual cupola fuel.

78. Producing Ductile Iron

Recounting the actual experiences in the production of ductile iron. Gives comparative properties and chemical analyses of test bars, etc. Shows some examples of finished castings.

79. Close Tolerance Molds

New and interesting subject "Plaster Molds Give Close Tolerances" is well-treated in this reprint from a recent issue of FOUNDRY. Get all the information you can about this new process. Not many left. First come, first served!

FIRST CLASS PERMIT No. 36 (Sec. 34.9P.L.&R.) Cleveland, Ohio

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FOUNDRY 5-51
Penton Building, Cleveland 13, Ohio

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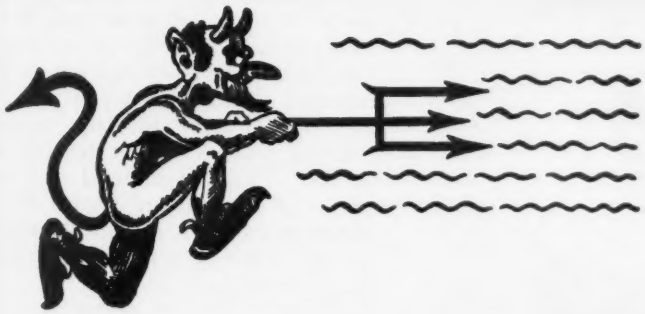
New Head Compound Saves Metal!



Soffel's New

Thermotomic "HOTOP" Carbon Free Liquidizer

AN EXOTHERMIC CARBON FREE LIQUIDIZER FOR IRON AND STEEL

SOFFEL'S THERMOTOMIC HoTop CARBON FREE LIQUIDIZER is an entirely new head compound, developed for use to reduce the height of feeding risers to one-third or one-half of their diameters. For an example, 6" x 6" feeding risers can be reduced 2" to 3" in height.

SOFFEL'S THERMOTOMIC HoTop CARBON FREE LIQUIDIZER is different from other head compounds in that SOFFEL'S THERMOTOMIC HoTop does *NOT* contain any powdered *metal*, is *NOT* a thermit type riser compound. It is a patented exothermic compound entirely free of metal, carbon, sulfur and phosphorous and can be used without danger of contamination on any ferrous metal or alloy.

SOFFEL'S THERMOTOMIC HoTop will permit reduction of feeding riser heights 60 to 70%. THERMOTOMIC HoTop LIQUIDIZER will produce temperatures well above 4000° F. This high heat increases the temperature of the feeding metal well above that of the metal in the main body of the casting, thus ensuring that the feeding metal will be the last to freeze. Shrink cavities under the feeding heads and porosity in the castings caused by premature freezing of the feeding metal are entirely eliminated.

Many advantages are to be gained by the use of SOFFEL'S THERMOTOMIC HoTop; chills in molds to induce directional solidification can in great measure be eliminated. A large amount of pouring metal is saved because of the smaller amount of metal required for feeding risers. Many more castings can be poured from a standard heat. The great reduction in heights of heads also saves metal, cost of remelting, also molding time. SOFFEL'S THERMOTOMIC HoTop will more than pay for its cost of use in savings of metal.

One major user, producing large castings has been able to reduce the pouring weight on one casing from 96,000 pounds to 76,000 pounds. This same user has poured twenty or more of these castings without any piping or shrinkage from the feeding heads into the casting since using SOFFEL'S THERMOTOMIC HoTop LIQUIDIZER. This not only represents a great savings in money and metal but permits an additional 20,000 pounds of metal that was saved from each casting, to be poured into other castings. SOFFEL'S THERMOTOMIC HoTop LIQUIDIZER produces equal savings on smaller castings also.

OTHER USES FOR IRON AND STEEL

SOFFEL'S THERMOTOMIC HoTop CARBON FREE LIQUIDIZER can be used in the ladle to increase the temperature of cold heats. It is also used to prevent or eliminate skulls in ladles. The great amount of heat and fluidity which it develops makes it ideal for the above applications.

SOFFEL'S THERMOTOMIC HoTop CARBON FREE LIQUIDIZER is also being used with a great deal of success as a hot topping in ingot production. Its great heat generating and insulating value combined with the fact that it contains no powdered metals which could contaminate the metal, makes it particularly suitable for eliminating hot tops in the production of ingot steel.

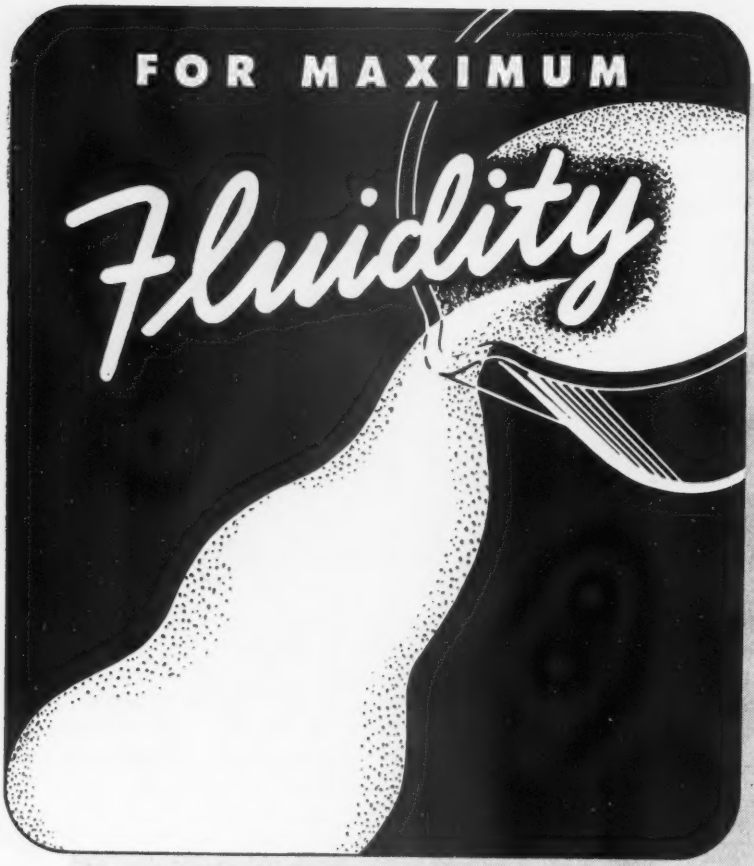
Complete instructions for reducing various heights of risers, are furnished with SOFFEL'S THERMOTOMIC HoTop LIQUIDIZER. See your supplier or write us for trial sample.

***Beware of Imitations:* We are the originators of Exothermic Carbon Free Liquidizers and Patented Thermotomic Compounds**

PITTSBURGH METALS PURIFYING COMPANY

Manufacturers of Fluxes and Purifiers for All Metals and Alloys

1352 MARVISTA ST., N. S. PITTSBURGH 12, PA.



"VICTOR" Ferrophosphorus

Victor Ferrophosphorus, a controlled product of the electric furnace, is a dependable means of increasing the phosphorus content of gray iron. Castings of intricate and fine design are truer to pattern and sharper in detail when poured from high phosphorus content metal. Large, thin sectioned castings are much more readily cast from irons with up to 0.80% phosphorus content.

"Victor" Ferrophosphorus may be used in the cupola or furnace charge or as a ladle addition to adjust conveniently and accurately the phosphorus content of base irons.

"Victor" Ferrophosphorus is sold exclusively by Hickman, Williams & Co. Complete information and technical service regarding applications and use of "Victor" Ferrophosphorus are available from your nearest Hickman, Williams office.

Hickman, Williams & Co.
(INCORPORATED)
CHICAGO · DETROIT · CINCINNATI · ST. LOUIS · NEW YORK
CLEVELAND · PHILADELPHIA · PITTSBURGH · INDIANAPOLIS
Established 1890

(*Continued from page* 210)

Flights are spaced on 18-in. centers. The chain is protected with heavy guards extending full length of conveyor. Chain speed is 70 fpm. Motor specifications are: ¾-hp, induction, 115 v, ac, single phase (except on 6-ft conveyor which is equipped with ½-hp); V-belt drive to roller bearing gearbox with easy belt tension adjustment; manual thermal overload-protected nonreversing control switch. Motor is mounted on top of channel for protection against heat of parts being handled.

For More Details Circle No. 20—Page 211

Core Tester: Claud S. Gordon Co., 3000 South Wallace St., Chicago 16—Instrument measures the core surface hardness by showing on a direct-reading graduated micrometer dial the depth to which an abrading point enters the material during three revolutions and under a constant force. The corresponding hardness value for the depth of penetration is found from a table of core hardness numbers. No computations are involved, and it is claimed that an accurate hardness test can be made in a few seconds. Instrument measures 2½ x 2½ x 5 in. and weighs 1 lb.

For More Details Circle No. 21—Page 211

Snap Flasks: V-G Flask & Fitting Co., Clinton, Conn.—Snap flasks are made of northern cherry lumber with specially designed malleable iron fittings. New hook type latch has a four-way locking action, which, when used in conjunction with an adjustable hinge, is said to make the flasks nearly as rigid as a box flask. All bearing surfaces are machined and the design is intended to compensate automatically for any wear. Other features include interlocking of boxed corners every ¼-in., plastic resin waterproof flue at corners, bolt and screw construction, two

(*Continued on page* 216)

MEETRITE

PIG IRON

Highest Quality

MORE USED THAN ANY OTHER MERCHANT PIG IRON

P M

PICKANDS MATHER & COMPANY

UNION COMMERCE BUILDING • CLEVELAND 14, OHIO

CHICAGO • CINCINNATI • DETROIT • DULUTH • ERIE • GRAND RAPIDS
GREENSBORO • INDIANAPOLIS • MINNEAPOLIS • ST. LOUIS • WASHINGTON

IRON ORE • PIG IRON • COAL • COKE

SIXTY-EIGHT YEARS OF SERVICE TO INDUSTRY

CRESCENT CHAPLETS

FUSE-TITE

If you don't see it here .... ask for it!

We manufacture a complete line of all types and sizes of Foundry Chaplets, and all kinds of wire and metal formations for your foundry use. If we don't already make what YOU need, we'll design and develop just the CHAPLET to suit your requirements. Your inquiries and specifications are invited . . . . for quick service, write for working samples. As a few of our specialties:

- **RADIATOR CHAPLETS**
- **SHOULDER CHAPLETS**
- **BOILER CHAPLETS**
- **DOUBLE HEAD CHAPLETS**
- **MOTOR CHAPLETS**
  (Regular or Extended stems)
- **TIN TUBES**
  (Plain or Perforated)
- **FOUNDRY NAILS**
  (Plain, Nicked or Barbed)
- **SKIM GATES**
- **CORE WIRES**
- **CORE PLATES and SHIMS**
- **TAPER DRIVE PLUGS**

CRESCENT FUSETITE CHAPLETS ARE MADE ACCURATE OF PROPER ANALYSIS MATERIALS FOR THE FUSING-IN PROCESS.

Being the Originators and Manufacturers of Radiator, Shoulder, Double Head and Motor Chaplets, Your Foundry benefits by our Chaplet Manufacturing experience since 1889 for the leading Stove, Radiator, Boiler and Motor Foundries.

We carry thousands of different types and sizes in stock for quick delivery, and have the facilities to make up special sizes promptly.

WRITE FOR SAMPLES AND PRICE LIST.

Crescent Brass & Pin Company

5766 TRUMBULL AVE.

DETROIT 8, MICHIGAN

(*Continued from page* 214)

coats of shellac inside and out to protect wood from moisture, 1 x ⅛-in. metal bands on top and bottom of flask, 1¼ x ⅛-in. sand strips at parting line, and reversible pins with finger grips on pin base for ease of handling.

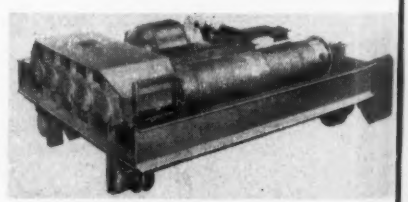
For More Details Circle No. 22—Page 211

Truck: Kalamazoo Mfg. Co., Kalamazoo 24, Mich.—Truck is designed and built for fast handling of materials and products of any kind. Equipped with a 2-cylinder,

13-hp, air-cooled engine, the truck has three speeds forward (15 mph maximum) and one reverse, rigid shoe-type internal expanding brakes and wheel turning radius of 64 in. It has a deck loading area of more than 20 sq ft with space beside driver's seat for long material. With pneumatic tires the payload capacity is 2000 lb; with puncture-proof tires the payload capacity is increased to 3500 lb.

For More Details Circle No. 23—Page 211

Trolley Hoist: Conco Engineering Works, Mendota, Ill.—Trolley hoist, available in 5 and 7½-ton capacities, features electric welded steel trolley frame and hoist gear housing and solid steel machine cut gears fully enclosed and operating in oil. Hoist is available with mechanical load



brake of Weston screw and disk type, or arranged for dynamic lowering with either alternating or direct current controls.

For More Details Circle No. 24—Page 211

Vibrators: Syntron Co., 540 Lexington Ave., Homer City, Pa.—Semi-noiseless electric vibrators for installation on bins, hoppers, and chutes achieve reduced operating noise due to use of rubber bumpers instead of metallic striking parts. Vibrators operate on 110, 220 or 440 v ac and are available in four models

(*Continued on page* 218)

THIS MONTH, 62,562* BUYERS OF CASTINGS WILL READ THIS AD...

This is one of a series of 6 full page ads emphasizing the expanding industrial acceptance of Brass Castings. Nationally circulated in outstanding trade journals and read by manufacturers, engineers, contractors, metallurgists, production control men—*these messages reach the men who specify and influence the purchasing of castings!*

R. Lavin & Sons, Inc.

THE METAL INDUSTRY REQUIRES
BRONZE CASTINGS
In All Operations From Mine to Finished Product
Cast Bronze roll neck bearings are required in the production of wrought metal products. Cast bronze withstands best the tremendous pressures and relatively high temperatures to which roll neck bearings are subjected.
Bronze is unique because it is used as an end product as well as a necessary tool in the production of other metal goods.
Mining equipment . . . milling equipment . . . fabricating equipment . . . rely upon cast bronze bushings, bearings, valves, etc., in the efficient production of metals from Mine to Finished Product.
Cast Bronze meets the requirements of both industry and consumer.
Specify—LAVIN NON-FERROUS INGOT—Quality
R. LAVIN & SONS, INC.
Refiners of Brass, Bronze and Aluminum
3426 SOUTH KEDZIE AVENUE · CHICAGO 23, ILLINOIS
REPRESENTATIVES IN PRINCIPAL CITIES
REPRINTS OF ENTIRE Brass Castings SERIES ARE YOURS FOR THE ASKING
The Foundryman's Problems . . . Are Our Problems!

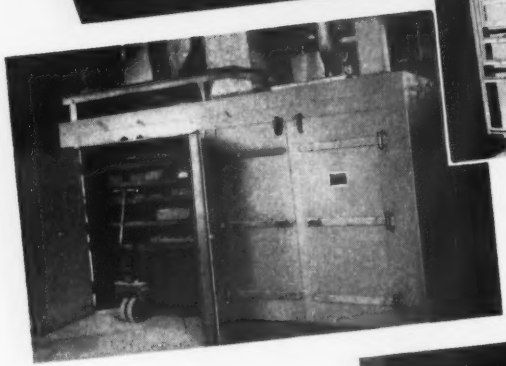
* Audited Circulation plus pass-on readership.

DO *Outmoded* FOUNDRY OVENS BITE DEEP into Your PROFITS?

Modernize with LANLY SERVICES

Outdated - inefficient ovens can "drag" on your production and profit figures like a "ball and chain."

"Old Junkers" are "out of step" in the march forward by progressive foundries.



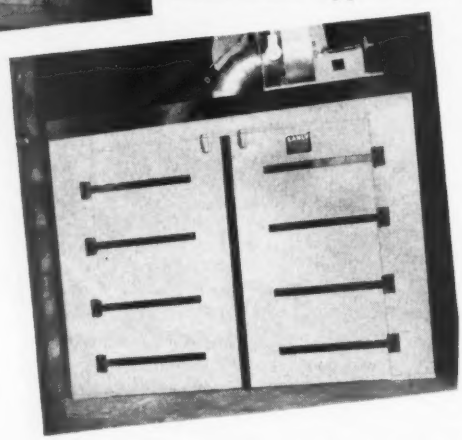
(Above) Drawer Type Oven.

(Left) Two Compartment Rack Type Oven.

THE oven requirements of the average foundry can be met with standard LANLY units.

Custom designed units for core baking, pasting and mold drying are part of LANLY'S services, as well as ovens for casting conditioning and heat-treating.

Write for the Catalog.



Rack Type Core Oven

THE LANLY CO.

OVENS FOR INDUSTRY

HEATED BY GAS, OIL, ELECTRICITY OR STEAM

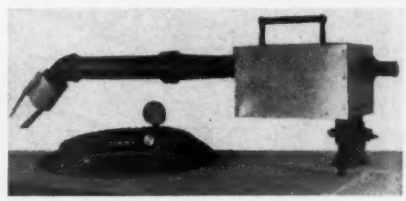
780 PROSPECT AVENUE CLEVELAND, OHIO

(*Continued from page* 216)

with capacities ranging for use on small hoppers containing as little as 20 cu ft of material to bunkers holding hundreds of tons. Intensity of vibration can be regulated to suit the material handled.

For More Details Circle No. 25—Page 211

Cupola Lighter: Hickman, Williams & Co. Inc., 1154 Union Commerce Bldg., Cleveland 14—Gas-fired cupola lighting device, developed by Fuel Research Laboratory Inc., Indianapolis, is portable and lights cupola without wood, oil, or special ports. It consists of burner head and gas-air mixing unit. Burner head is inserted through the tuyeres, which must have a minimum diameter of 4 in. End of burner head inserted into cupola projects down at an angle of about 45 degrees, directing flame toward sand bottom. In operation,

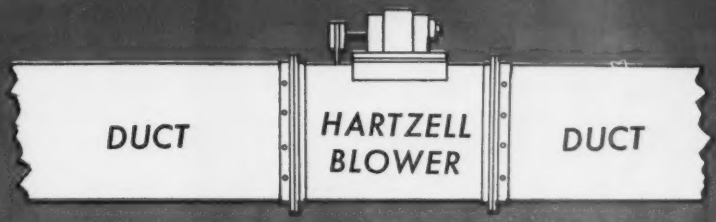


three-fourths of bed is placed in position in usual manner, and pockets are made at the tuyeres to be fired by removing several pieces of coke for inserting burner. Number of tuyeres to be fired depends on size of cupola —three in 36 to 48 in. cupolas, three to four in 54 to 60 in., and all tuyeres for those above 66 in. diam. Each selected point is fired 6 to 8 minutes. It is claimed that use of the lighter will eliminate all smoke and cold iron at start of the heat, and save at least one hour in preparation and ignition of the bed. Unit uses propane gas, compressed air and oxygen, and will create a ball of fire 18 to 24 in. diam in the cupola in 6 to 8 minutes.

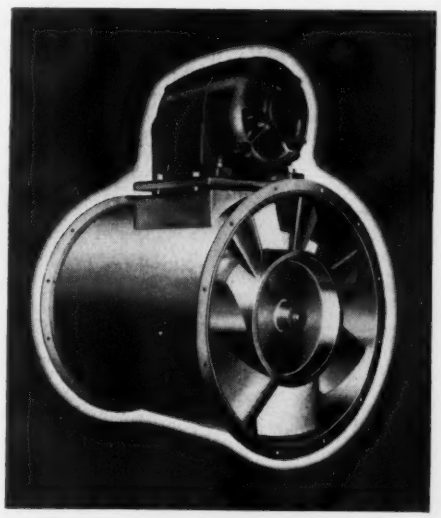
For More Details Circle No. 26—Page 211

Safeguard: General Electric Co., Schenectady 5, N. Y.—Electronic combustion safeguard system for commercial oil burners is said to assure protection against combustion failure. If the gas pilot does not ignite, the oil valve cannot open, and if the oil flame does not ignite, the supply of fuel is cut off. After the cut-off, the motor continues to operate for 30 seconds to purge the nozzle or cup of unburned fuel to prevent carbonizing and reduce field servicing. The system then is locked against further operation until manually reset. Motor circuit is controlled by a built-in contactor for motor ratings

(*Concluded on page* 220)



the HARTZELL vaneaxial blower is *EASY* to install

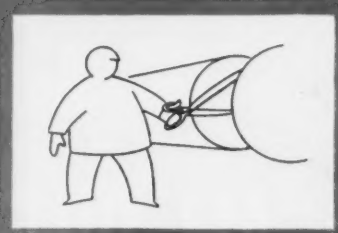


A POWERFUL BLOWER

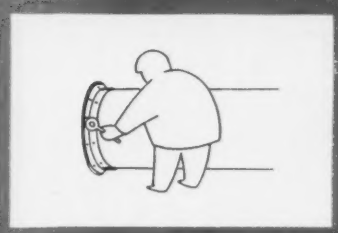
efficient against very heavy pressures

Maybe you didn't realize this: A single Hartzell 48" Vaneaxial Blower can move 71,100 CFM against a half-inch static pressure, consuming just 50 HP, or 41,100 CFM against *seven-and-a-half* inches, with 65.3 HP. That's air-moving power against pressure! So, you see, there's no need to put up with clumsy, power-wasting air-moving devices which require an engineering crew for installation and clutter up valuable floor space. Get the *complete* economy of Hartzell Vaneaxial Blower design and construction . . . economy which begins with purchase price and installation and saves your money year after year.

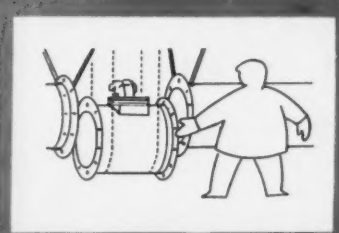
cut out a duct section same length as blower



bolt angle-iron flanges to duct ends



bolt the blower to the duct ends just installed, and brace duct flanges



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(*Concluded from page* 218)

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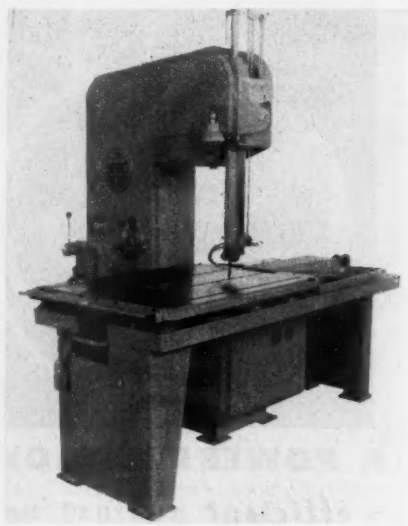
For More Details Circle No. 27—Page 211

Band Machine: DoAll Co., 254 North Laurel Ave., Des Plaines, Ill.—Band machine is equipped with 36-in. stroke hydraulic work table for power feeding heavy metal work sections in band sawing, grinding or filing operations. Table operates hydraulically and is said to handle work weighing up to 1 ton. Its feed rate is variable to 18 fpm with rapid return. Work feed pressure and rate of travel are controlled and governed by material machinability for protection and conservation of the band tool being used. Tool utilizes diamond and line grinding bands in addition to standard precision and buttress saw bands and abrasive polishing bands up to 1-in. wide, also file bands of various shapes and cuts ¼, ⅜, and ½-in. wide. Cutting speeds are infinitely variable from 40 to 10,000 fpm. Machine is powered by a 7½-hp motor. Automatic hydraulic aircraft type disk brakes stop the machine if saw bands are broken and when motor is shut off. Built-in welder for joining bands, job selector dials and combination spray or flood coolant system are other features.



For More Details Circle No. 28—Page 211

Racks: American Metal Products Co., Dept. 27, 5959 Linsdale, Detroit 4—Prefabricated pallet and skid racks are designed to save floor space and give modern efficiency in storage. Racks are assembled without bolting or welding, the design permitting horizontal and upright frames to be put together in a "pressed fit."

For More Details Circle No. 29—Page 211

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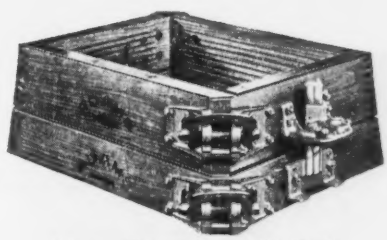
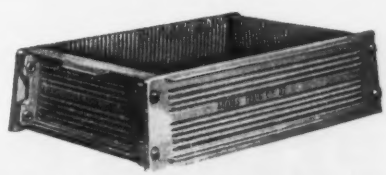


Adams Cherry Easy-Off Flask



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Steelmaking for Castings

(*Continued from page* 101)

In the acid furnace, a 3-in. layer of insulating cement is spread over the pan plates, followed by one or two courses of clay brick. The rest of the bottom is formed of silica brick, and fused silica sand. In basic furnaces the insulating cement and a course of clay brick are usually used, but the exact make-up of the rest of the lining varies in different shops. Formerly some 9 to 18 in. of magnesite brick were laid over the clay brick, but today chrome ore brick generally are preferred. They are cheaper and have a lower rate of heat transfer, so that they decrease the loss of heat through the bottom. Sintered or rammed-in basic material to a thickness of at least 15 in. completes the bottom.

For many years the bottoms of both acid and basic furnaces were built up of successive thin layers sintered in place over the brick, and many operators still prefer this practice. For acid bottoms, a silica sand containing about 96 per cent SiO_2 is used; most steel foundries obtain this material from pits in Ohio. Basic bottoms are built up of dead-burned grain magnesite, mixed with basic slag in the proportion of 3 parts magnesite to 1 slag. The purpose of the slag is to lower the refractoriness of the mixture so that it will sinter at the furnace temperature. Dead-burned dolomite sometimes was used in past years in place of magnesite, but never proved fully satisfactory. In storage it slakes by absorbing moisture from the air, as lime does, and if the furnace is shut down for a week or so, a dolomite bottom will deteriorate in the same manner.

Build Up the Bottom

To build a sintered bottom, the furnace is first brought up to full heat, and a layer of bottom material about 1½ in. thick is spread over the brick lining with shovels. The furnace is maintained at high temperature until this layer has softened. The operators poke the bottom with steel bars to ascertain when it has started to sinter. A second layer is then shoveled in and set, and so on until the bottom has been built up to the full thickness.

Of late years a few acid furnace operators have adopted the practice of ramming in the entire bottom cold and then sintering it, and the same procedure has become quite common on basic furnaces. For acid furnaces the sand is mixed with molasses or some similar material such as the sulphite pulp residues used to bond dry sand molding mixtures. It is then

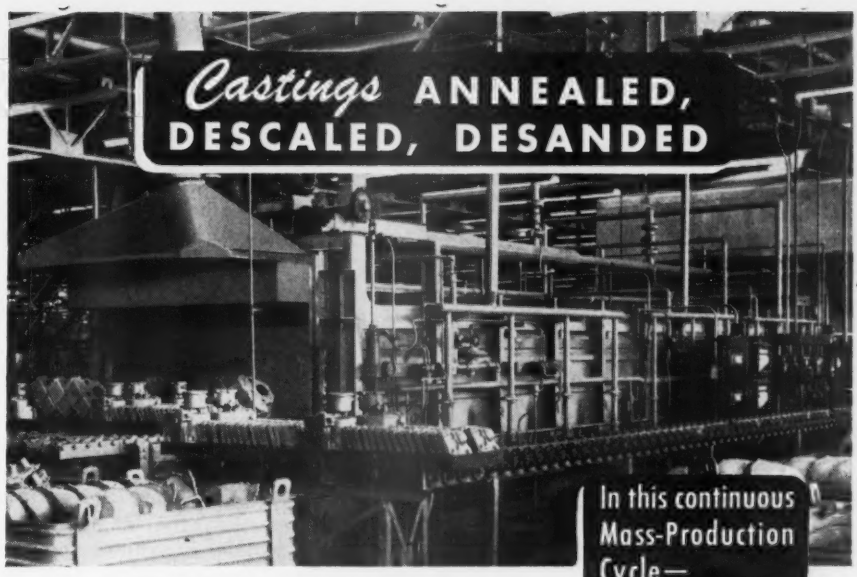
shoveled into the furnace in layers a few inches thick, and rammed down hard with air rammers. In basic furnaces, grain magnesite and slag bonded with tar, or mixtures of chrome ore, magnesite and other materials sold under a variety of trade names, are similarly handled, and the bottom made up to full thickness before the furnace is heated.

When the furnace is ready for heating up a wood fire is built in the hearth, the stack damper is opened wide, the reversing valves set on center, and a fire built at the base of the stack to create the necessary draft. The fire in the hearth should not be driven so hard that the flames touch the roof, since too sudden heating of the silica brick will cause them to crack and spall. When fuel gas is available, a number of burners distributed over the hearth may be used instead of the wood fire. The heat is maintained for several days, to dry out the brick-work thoroughly, then the valves are thrown over, the oil or gas turned on, and the combustion air fans started.

Temperature Increased Slowly

Until the furnace reaches red heat, the flame is kept small, the valves are thrown over every 30 or 40 minutes, and the temperature is increased slowly. Once the brick are red hot, there is not much risk of spalling them, and the furnace may be brought to working temperature quite rapidly. As already mentioned, the nuts on the tie rods are loosened at intervals to permit the roof to expand.

A bottom rammed in cold must be held at high temperature long enough to sinter it to full depth. It does not take as long, however, to make and set a bottom in this way as it does to build it up hot in successive thin layers. By whatever method it is placed, the completed bottom is generally "slagged" by shoveling successive lots of crushed slag on the banks, and melting it down until a pool of liquid slag has accumulated. This is splashed against the banks, and extra bottom material is shoveled in to build up areas that do not conform to the proper outline. The slag then is tapped out, and the furnace is ready to charge. The taphole in a rammed-up bottom is formed by means of a wooden plug of the proper size, around which the bottom material is tamped. In forming sintered bottoms a steel pipe or a piece of electric furnace electrode is used to form the hole. In acid furnaces, the taphole is necessarily formed of silica sand. For basic linings, as already mentioned, chrome ore is the best material to



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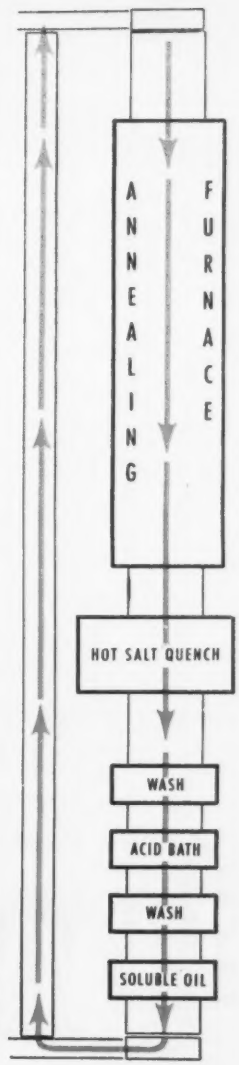

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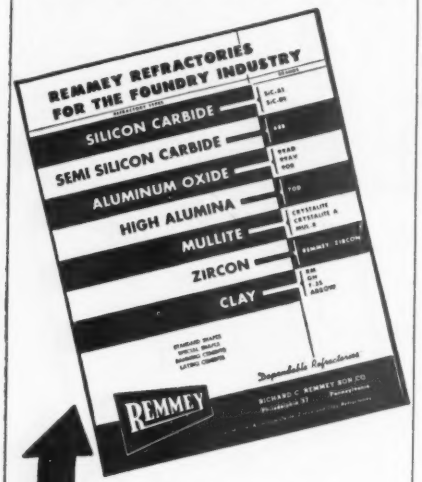

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use. In operation, acid furnace tapholes are closed with silica sand mixed with fine anthracite coal, and grain magnesite and coal are used for the purpose in basic furnaces. Some operators recommend omitting the coal and closing basic tapholes with magnesite alone.

It is important that, when the heat is tapped, no steel be left in the hole or in pools in the bottom from which it can run into the tamping in the hole, before it has set. The taphole is scraped out carefully, pools of steel in the bottom are splashed out and, if necessary, oxygen is used to burn away any steel that otherwise cannot be removed. The hole is closed from the outside by ramming the sand or magnesite against a paddle introduced through one of the charging doors, and finally several shovelfuls of bottom material are spread over the inner end of the opening. No steel must be allowed to run into the material closing the hole, because it freezes into a hard mass that cannot be pierced with the tapping bar. These "hard taps," formerly the nightmare of open-hearth furnace crews, are today readily opened with the oxygen lance. The crew on the charging floor then punch out the rest of the material in the hole with a long bar, just as they do when the taphole can be opened by punching through it from the outside.

After the heat has been tapped, the furnace bottom and banks should be carefully inspected, and any holes containing pools of steel should be splashed out with rabbles. In basic furnaces, accumulations of bottom material sometimes must be cut down by throwing iron ore or crushed spiegel on them, and keeping the furnace at full heat until a pool of slag is accumulated. When this is tapped out, an oxygen lance introduced through the taphole may also be used to even up the bottom and get rid of pockets of metal. The banks are always cut away at the slag line, and are restored to proper contour by shoveling in bottom material. The cleaned-out holes in the bottom are also filled up, and the furnace kept at heat until the patches are set. The fuel is then cut off for a few minutes, to harden the bottom before the next heat is charged.

If steel is left in holes in the bottom, and merely covered with bottom material, the succeeding heats will enlarge the opening, and before long the steel will bore through the lining and break out. When this is about to happen, a vigorous boil is set up at the threatened spot. If the steel is cutting through high up on the banks, it may be possible to prevent a breakout by shoveling 15 per cent ferrosilicon, spiegel and bottom material into the threatened spot to fill up the hole. An impending breakout through the bottom, however, cannot be stopped, and the only thing to do is to open the taphole and run the heat into a ladle. If it was nearly ready to tap when the trouble started, final additions may be made to the ladle and the metal poured into castings. If not, it is run into ingot molds or poured into a pig-bed, and salvaged as scrap.

Rolling mill open-hearth furnaces are seldom less than 100 tons capacity, and larger ones holding 200 and 300 tons are regularly operated. Few foundries use furnaces of over 50 tons capacity, and in the majority of shops 25 to 30 ton furnaces are preferred. The nature of the process, too, is quite different in the two

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types of plants. The big mills reduce iron ore to pig iron in blast furnaces, and convert this pig to steel by the open-hearth process. Considerable steel scrap is charged in these furnaces, but to a certain extent the conversion of scrap to new metal is only incidental to the process of producing steel from ore. The pig iron is usually kept liquid in large, fuel-fired mixers, is brought to the open-hearth floor in ladles as required, and is poured into the furnaces in several successive batches. The process is carried out in such a way that the silicon, manganese and carbon are rapidly oxidized out of the pig iron by reaction with an actively oxidizing slag. The furnace charge in this practice is made up of from 40 to 50 per cent pig iron, and from 50 to 60 per cent steel scrap.

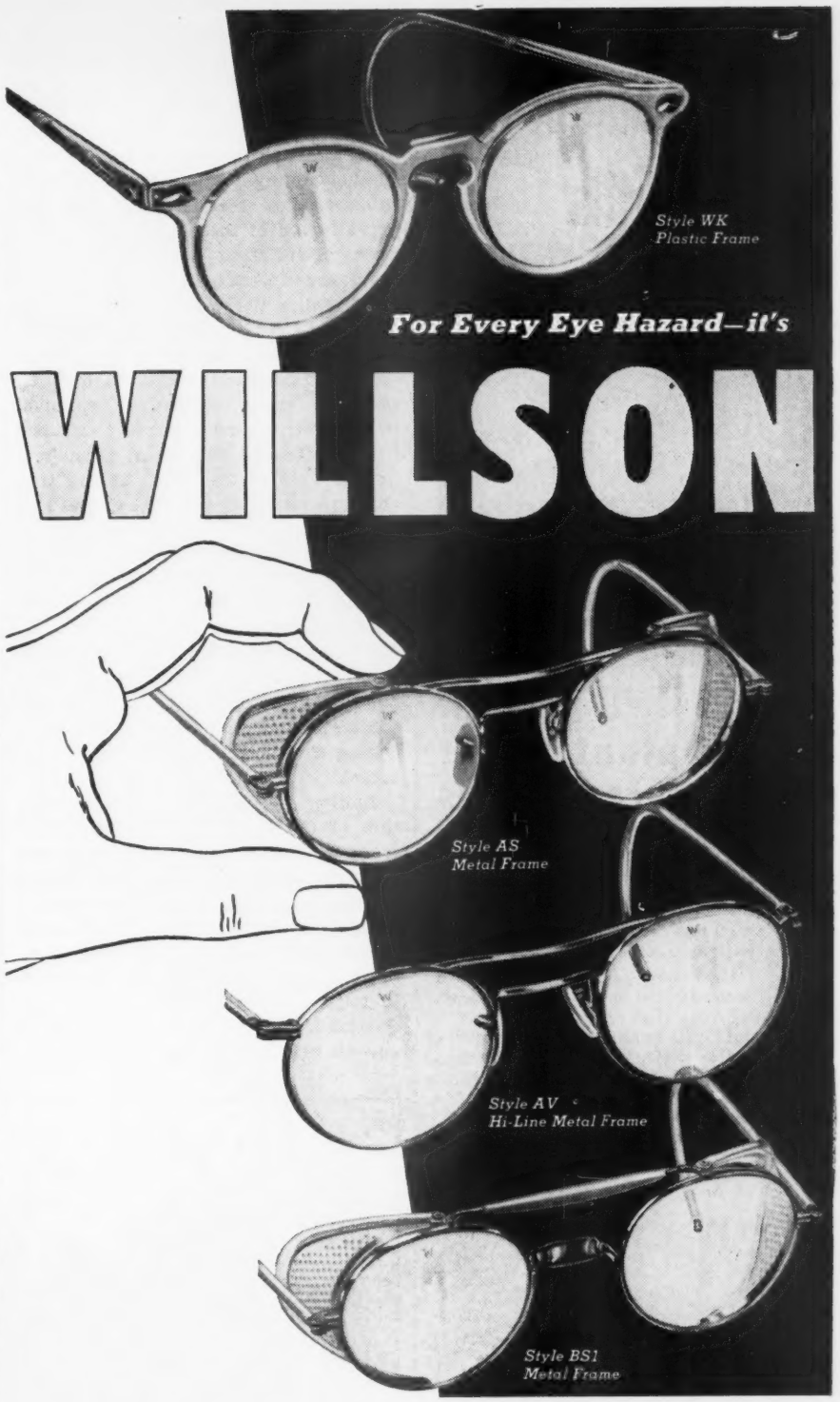
Convert Scrap to Steel

Steelmaking in foundries using open-hearth furnaces, on the other hand, is chiefly a process of rapidly and economically converting steel scrap to new steel. In acid practice, the charge is usually 85 to 90 per cent scrap, in basic furnaces 75 to 80 per cent, occasionally as low as 70 per cent.

Steel poured into castings contains on the average 0.25 to 0.50 per cent C, about the same amount of Si, 0.60 to 1 per cent Mn, and 0.04 per cent each of P and S, the remainder being metallic iron. As the average analysis of steel scrap varies little from the above figures, it might be supposed that scrap could readily be melted down and poured into the molds, as is done in the case of many nonferrous metals. For several reasons, however, open-hearth steel cannot be made in this way.

In the first place, the flame of a fuel-fired furnace necessarily contains an excess of free oxygen, and at the high temperature required to melt steel, the silicon, manganese and carbon of the metal readily combine with oxygen. The products of that reaction are silica, (SiO_2), manganese oxide (MnO), and carbon monoxide (CO). The first two combine with other materials to form slag, and the third is carried off in the products of combustion. If only steel scrap were charged into the furnace, therefore, the melted metal would contain much less than the desired amounts of the necessary elements.

This loss of metalloids in melting could be compensated readily, either by charging with the scrap, ferroalloys containing the required amounts of C, Si and Mn, or by adding these metals to the bath after melting is completed. However, steel in melting not only loses much of the



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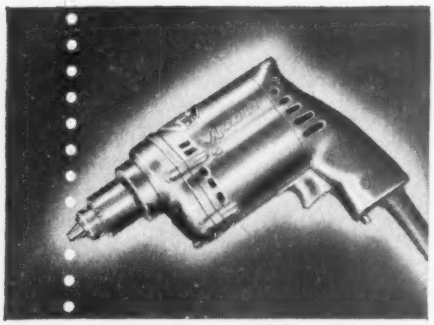

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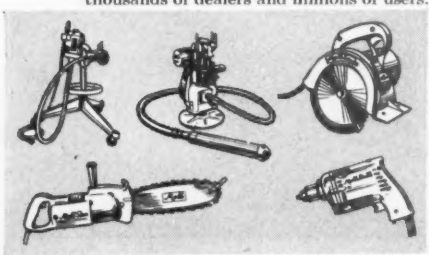

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metalloids it contains, but also absorbs and holds in solution considerable hydrogen and nitrogen. If allowed to remain in the metal, these bases are liberated as the steel solidifies, and are trapped in the interior of the castings, producing numerous cavities. The steel is freed from the greater part of these undesirable gases by generating large amounts of CO in the molten bath.

The vigorous boiling action produced by CO rising through the metal sweeps the other gases along with it. To produce sufficient CO for this purpose, extra carbon is supplied in the charge, and is rapidly oxidized to CO after all the metal is melted, by the FeO in the slag. As pig iron contains some 3½ per cent C, and also varying amounts of Si and Mn, it is generally used to add the required amount of excess carbon to the bath. Enough is charged to permit the steel to be "boiled" vigorously, without eliminating all the carbon. At the same time, the pig iron provides enough Si and Mn to prevent the total elimination of these metalloids during the melting and boiling of the metal.

Boiling of the bath by rapid evolution of CO not only frees the metal from dissolved gases, but also causes a vigorous circulation and brings fresh amounts of steel to the surface to be heated by the flame. A vigorously boiling bath absorbs heat much faster than one that lies quiet, therefore it must be heated entirely by conduction from the surface. The extra carbon provided by the pig iron thus has three functions—to prevent the melted bath from being entirely carbonless, to wash out undesirable dissolved gases, and to make the molten steel circulate and thus absorb heat more rapidly.

For reasons of economy, the amount of pig iron melted with the steel scrap in foundry practice is kept as low as possible. In a normal market, steel scrap is a little cheaper than pig iron, and it contains approximately 99 per cent metallic iron. Pig contains some 3½ per cent C, 1 to 2 per cent Si and 1 to 2½ per cent Mn, practically all of which are oxidized and lost in melting and conversion. The metallic iron in pig, therefore, is a little under 95 per cent. The higher iron content of scrap is, to a certain extent, offset by a greater loss of iron in melting, especially if much of the scrap is thin and light. Thus greater oxidation of iron, however, does not equal the loss in carbon, silicon and manganese in melting pig, so that even at identical prices, scrap is a little cheaper. The lower the relative price, the greater the advantage in using high proportions of scrap.

Restricting the amount of pig in the charge also decreases the time required to make a heat and, therefore, the conversion cost. As there always has been enough steel scrap available to meet requirements of the steel foundries, it is obviously to their advantage to use as much of it as possible. If the big steel mills remelted similar amounts of old material, however, the supply would

METALS CONSERVATION COMMITTEE has been formed by Federated Metals Division, American Smelting & Refining Co. to work on nonferrous metals shortage problems. Front row, left to right, are: A. M. Callis, manager, Newark Plant; Dr. A. J. Phillips, director, research department, American Smelting; E. L. Newhouse Jr., Federated head and committee chairman; R. D. Taylor, assistant general manager. Back row, left to right: E. L. Rimbault Jr., general sales department; M. Foodim, assistant to vice president; E. L. Newhouse III, sales manager, Eastern Division; J. W. Kelin, sales manager, Whiting Plant, and H. L. Smith, executive technical engineer

soon be used up and exhausted.

During the past few years there have been several periods when the big mills, which supply most of the country's pig iron, could make only enough to keep their own open-hearth furnaces busy, and had none to sell. The steel foundries, unable to buy enough to meet their requirements, were then obliged to adopt a method of steelmaking that was first introduced many years ago in California where scrap was abundant and pig iron scarce and costly. In this process, the required carbon content in the melted bath is obtained from graphite, petroleum coke or ordinary metallurgical coke used as part of the charge. To prevent loss by oxidation, these materials usually are buried under the greater part of the scrap, so that they are covered with melted metal at an early stage of the melt-down and thus are more completely absorbed by the bath.

Metalloids Remain in Bath

When most of the carbon is obtained from coke or graphite, alloys of iron containing high proportions of manganese and silicon are added with the charge, so that a certain amount of these metalloids will remain in the molten bath. This is desirable, because at the temperature obtaining during the melt-down, silicon and manganese have a greater affinity for oxygen than iron does. Therefore, they are oxidized in preference to iron, and thus reduce the loss of iron and the production of FeO. When the usual proportion of pig is used in the charge, the silicon and manganese it contains perform this desirable function. Instead of depending entirely upon high-content alloys of silicon and manganese for this purpose, most operators prefer to use a certain amount of pig, and derive only part of the necessary carbon from coke. The method is now well established in steel foundries, however, as a means of holding down the proportion of pig iron in open-hearth charges.

Graphite and petroleum coke are quite free from sulphur, while metallurgical coke contains a varying proportion of that element. When using ordinary coke in the acid furnace, its sulphur content must be rigidly restricted, and even in basic practice an increase of sulphur content is undesirable because it necessitates the use of extra lime and correspondingly lengthens the time of a heat.

In steel foundries a considerable proportion of the charge consists of heads and gates and rejected castings that have been broken or cut to chargeable size. The amount of this shop scrap returned to the furnace

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varies in different plants. When the castings produced require only rather small sinkheads and short gates, the yield of good castings is high and the amount of scrap to be remelted correspondingly low. In most open-hearth foundries, about 35 per cent of the total charge will be shop scrap.

The purchased scrap should be composed in part of fairly heavy material, such as forging crop ends, steel rails and car wheels, thick plate trimmings, and so on. As a rule, it is necessary to charge only a portion of the scrap, partially melt it, and then get in the rest. If there is too much light material to be melted, it occupies so much space per unit of weight that it has to be charged in several successive batches, and the time required to make a heat is thus greatly lengthened. Another disadvantage is that the oxidation loss in melting it is greater, and the yield of steel correspondingly lower than when heavier pieces are available. Thick machine shop chips from hogging cuts can be melted readily, but light turnings are difficult to handle. They stick to the bottom of the furnace, melt slowly and often must be pried up with bars before they will finally melt.

When old rails and other high-carbon steel scrap can be obtained, less pig need be used to contribute carbon to the charge. As these high-carbon materials are also generally fairly heavy, they are in great demand for steel making in foundries.

Instead of resorting to graphite or coke to replace pig iron in open-hearth charges, one or two of the smaller shops making ingots have installed cupolas to melt down steel scrap. By treating the melted metal in the ladle with fused soda ash, a large part of the sulphur is eliminated, so that a lower grade of scrap can be handled by this method than when the entire charge is melted in the open-hearth furnace. As steel scrap absorbs some 2 to 2½ per cent C from the coke when it is melted in a cupola, the practice in shops using this method is much like that in the big mills that handle large amounts of molten pig from the blast furnaces. The desulphurized cupola metal is transferred to the open-hearth furnaces and poured into the hearth through spouts set in the charging doors, after the rest of the charge is melted. A considerable increase in output can be attained by this method, but as far as the author is aware it has not yet been adopted in any steel foundry. As operated in iron foundries and in steel foundries using side-blown converters, the cupola is the cheapest method of melting metal.

When the melted metal is to be used as part of the charge in open-hearth furnaces, it would be possible to run each cupola only until it had melted the required amount of scrap and then shut it down. To operate in this way, however, it would be necessary to know just when the open-hearth furnace would be ready for charging. Even in ingot-making practice it is not always possible to conform to an exact time schedule, and in operating steel foundry open-hearth furnaces there are always unexpected delays, because the melting schedule must conform to the requirements of the molding and closing floors.

To supply hot metal in sufficient quantity at irregular intervals on short notice, and to melt it in a short time, rather large cupolas would be required. At least two would be needed for a single open-hearth furnace, one being patched while the other was in operation. If there were more than one open-hearth furnace to be supplied, the number of cupolas would be increased correspondingly.

Shops that have adopted this method have not used large cupolas that would melt the required amounts of metal in a few hours, but have installed smaller ones, operated on a semi-continuous schedule, and kept in blast for several days at a time. Melted metal is tapped into large, fuel-fired ladles similar to the mixers in the big mills, and is transferred to the open-hearth floor at intervals in smaller ladles. The soda ash treatment is carried out in the large ladle, fresh batches of soda ash being added at regular intervals as the melted metal accumulates.

Use Special Cupola Lining

If a cupola were operated in this way, the lining in the melting zone would be completely cut away in a short time unless some means were provided to prolong its life. One way to do this would be to line the melting zone with material more resistant to slags rich in iron oxide than the clay brick generally used. Of the available refractories, only magnesite has the property of resisting attack by iron oxide, and magnesite linings are difficult to maintain in cupolas that must be cooled off at regular intervals.

The other solution is water cooling of the lining at the critical areas. In one plant the cupola shell outside the melting zone is cooled by a heavy spray of water, and the cupolas are kept operating two or three days at a time. Baked fire clay is so poor a conductor of heat that the lining cannot be effectively protected by thus

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cooling the bricks only at one end. In another and probably a better design adopted in at least one shop, water-cooled bronze blocks, such as used in blast furnaces, replace many of the bricks in the lining at the melting zone.

Even if it should prove possible to operate a pair of cupolas in this way and thus provide a steady supply of hot metal, it would not be easy in a steel foundry to keep the cupolas and the open-hearth furnaces in step, and it is not surprising that no steel foundry has yet been willing to adopt the practice.

(To be continued next month)

IBF To Hold 48th Annual Conference June 12-15

Annual conference of the Institute of British Foundrymen will be held at Newcastle-on-Tyne, June 12-15. It will open Tuesday evening, June 12, with a reception by the Lord Mayor and Mayoress. Six technical sessions will be held on Wednesday and Thursday, and Friday will be devoted to visitations to foundries in the vicinity. Tentative program follows:

Wednesday, June 13

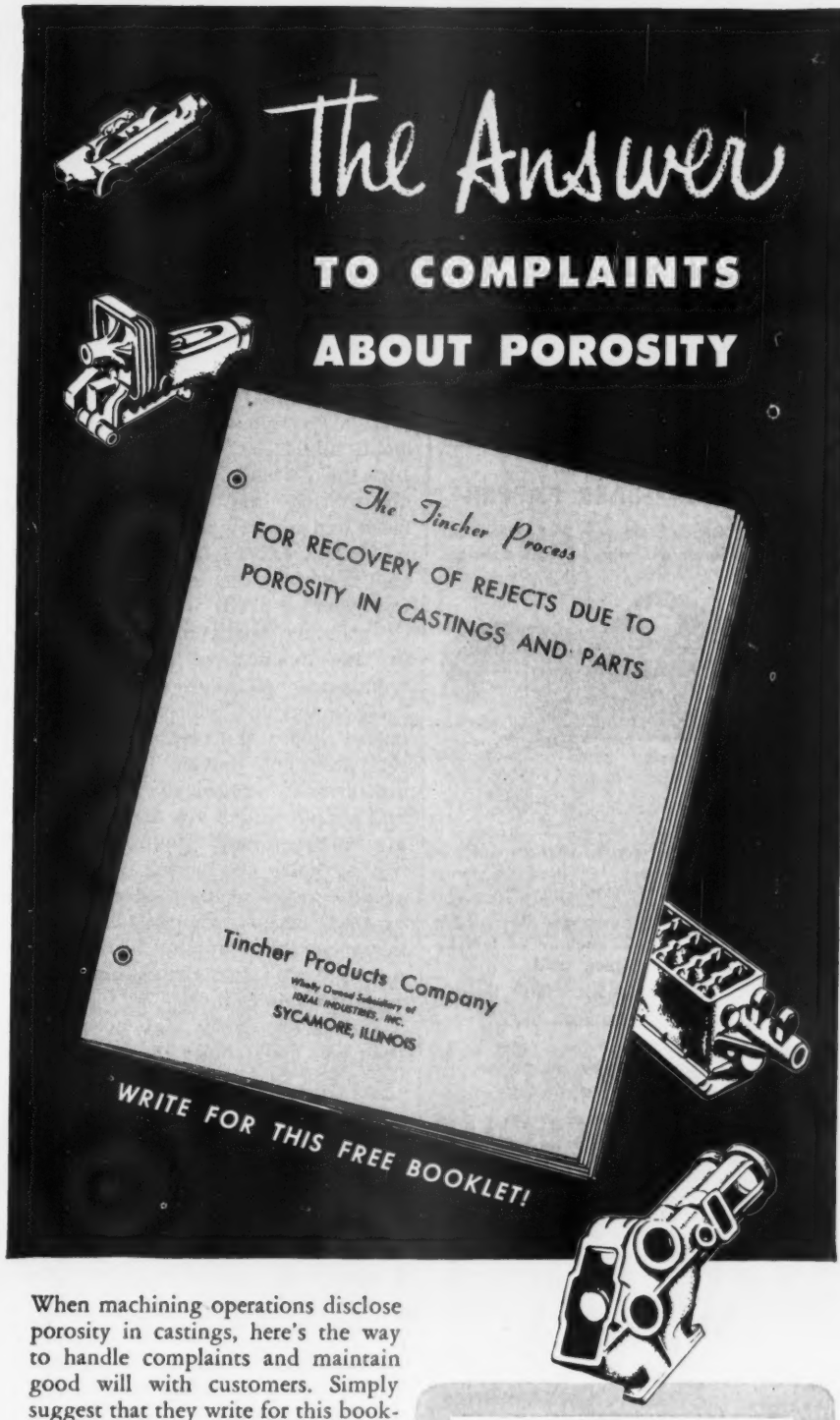
9:15 a.m.—Annual general meeting. Presentation of awards.
11:00 a.m.—Presidential address.
11:30 a.m.—Edward Williams Lecture—"Properties of Materials and the Engineering Uses of Cast Metals" by R. W. Bailey.
1:00 p.m.—Luncheon.
2:15 p.m.—Technical Sessions:
Session A—"Some Thermal Considerations in Foundry Work" by Dr. V. Paschkis (AFS exchange paper). "Study of the Industrial Applications of Platinum/Platinum-Rhodium Thermocouples" by M. Chaussain (French exchange paper). "Some Factors Affecting the Solubility of Carbon in Iron" by R. V. Riley.
Session B—"Report and Recommendations of Sub-committee T.S.30-Synthetic Resin Core Binders." "Patternmaking—Some Present-day Practices" by B. Levy. "Making an Ingot Mold in India" by S. N. Rao.
7:00 p.m.—Reception by President.
7:30 p.m.—Annual Dinner.

Thursday, June 14

9:30 a.m.—Technical Sessions:
Session A—"Production of Heavy Castings for Electrical Generating Equipment" by N. A. Charlton. "Manufacture of Propellers and Other Castings in a Heavy Jobbing Foundry" by C. W. Stewart. "A System of Studying Casting Defects" by G. W. Nicholls and D. T. Kershaw.
Session B—"Casting Characteristics of Some Aluminum Alloys" by D. C. G. Lees. "D.T.D. 424—The Versatile Alloy" by A. P. Fenn. "Aluminum Casting Alloys—a Survey of Their Properties and Methods of Production" by F. H. Smith.
1:00 p.m.—Luncheon.
2:30 p.m.—Technical Sessions:
Session A—"The Reduction of Dust in Steel Foundry Operations" by W. A. Bloor. "Observation and Control of Dust in Foundry Dressing Operations" by R. F. Ottignon and W. B. Lawrie. "Dust Flow", a film. "Survey of the Method and Principles Involved in Mechanical Charging of Cupolas" by W. J. Driscoll.
Session B—"Report and Recommendation of Subcommittee T.S.20—Soundness of Iron Castings". "Steel Foundry Radiographic Practice" by G. M. Michie. "Report and Recommendations of Sub-committee T.S.31—Heat Treatment of Gray Cast Iron."
8:30 p.m.—Entertainment.

Friday, June 15

9:15 a.m.—Plant Visitations.
7:30 p.m.—Dinner Dance.



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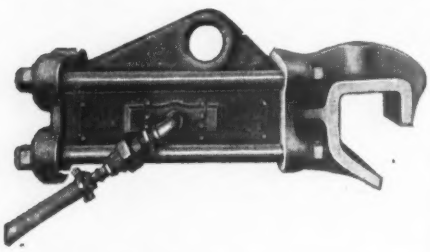

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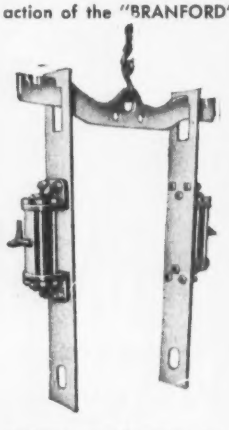

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Aluminum Die Castings

(*Continued from page* 100)

essary dimensions. Larger tolerances, where permitted by the nature of the application, will speed up production.

Trimming and Finishing—Because of their smoother surfaces and closer dimensional tolerances, die castings require little machining and finishing. For many die castings, only simple trimming is required.

First the sprue and any heavy gates are sawed off. The next operation is to remove the runners, the metal that has solidified in the vents, and the "flash" that forms at the die parting line and around cored holes and ejector pins. Simple castings often can be trimmed by a special trimming die in a punch press. Complicated parts may require filing or grinding operations, or both, as in the finishing of other types of aluminum castings.

Machining of die castings is required where the casting process itself does not provide the necessary dimensional accuracy. Light cuts and simple setups are the rule. Other die castings may require the drilling of holes too small to be cored economically; reaming of cored holes or squaring of surfaces where draft is undesirable; tapping or threading; or machining undercuts that cannot readily be die cast.

Unless extremely high accuracy is required, cored holes may be reamed or tapped without pilots. Small holes may be drilled without jigs by the use of starting centers or spots cast into the surface of the part.

The same methods of machining are employed with aluminum die castings as with other types of aluminum castings. High machine speeds are recommended. Special attention should be given to cutting tools for maximum production. High-speed steel tools are recommended for the majority of alloys; but for alloys of high silicon content, which are somewhat abrasive, cemented-carbide-tipped tools give best results.

The following recommended practices represent the principal differences between aluminum and other metals in respect to tools:

1. Grind more top and side rake than is common for machining steel.
2. Keep cutting edges sharp and free of burred or wire edges.
3. Maintain smooth, bright tool surfaces free from scratches.

A generous amount of cutting compound generally is desirable when machining aluminum. For the small amount of machining usually required on die castings, however, compressed air may be employed to cool the work and blow away the chips, and the use of a cutting compound may be omitted.

The same wide range of finishes may be applied to aluminum die castings that are used on other forms of the metal. For many purposes, no

MERITORIOUS SERVICE: Alexander I. Krynitsky (left), formerly chief of the experimental foundry, National Bureau of Standards, Washington, retired from government service Nov. 30. Charles Sawyer (right), Secretary of Commerce, on Feb. 14 awarded Mr. Krynitsky a Meritorious Service Medal and a Certificate of Merit inscribed with the following citation: "For extremely competent performance of official duties for over 32 years in the National Bureau of Standards, including valuable contributions to science and technology in the field of foundry metallurgy"

special surface treatment is needed, as the metal has an attractive appearance which suffers little change under a wide variety of service conditions.

Simple mechanical finishes such as polishing, buffing or brushing produce attractive surfaces which meet all the requirements of many applications. Where the plain aluminum surface does not provide the desired qualities, a large number of easily applied finishes are available, ranging from the purely utilitarian to the high decorative. They include chemical, anodized and electroplated finishes of the same types that are applied to other forms of aluminum. Like other metals, aluminum also may be successfully painted, lacquered or enameled.

Inspection and Quality Control — To assure delivery of castings of uniformly good quality which meet dimensional and other specifications, a program of inspection, testing, and quality-control procedures is necessary. Ultimate customer satisfaction with die-cast products depends so heavily on these operations that they merit most careful attention.

Before a program of inspection and testing can be established for a given casting, it is essential that the standards which that casting must meet be accurately determined. Dimensional tolerances must be clearly specified and understood by all inspectors checking dimensions. Likewise, the plant metallurgists must know what ranges in alloy composition are required.

Inspectors should be instructed regarding the dimensions or any other variables where troublesome deviations are most likely to occur. They must also know what defects are to be guarded against. In other words, all inspectors should know what to look for.

The first or hot inspection is visual and is made right after the castings come from the die casting machine and before they are trimmed. The castings are examined for surface defects, poor filling, cracks and the like, also deviations of machine locating points from specified limits. Under this category comes also the periodic analysis of all alloys to be sure they conform with customer specifications. ASTM specifications cover accepted methods of chemical analysis and are often followed in checking the alloy composition. In recent years, spectrographic analysis has become common for routine alloy composition checks.

Process or floor inspection follows the castings through the trimming and finishing operations. Inspectors

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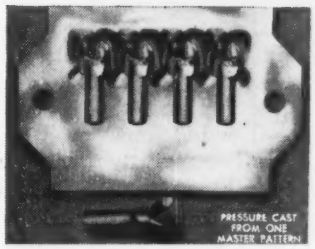

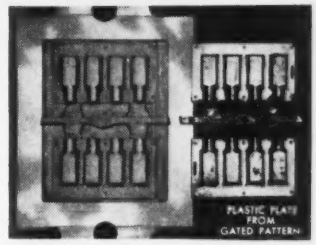

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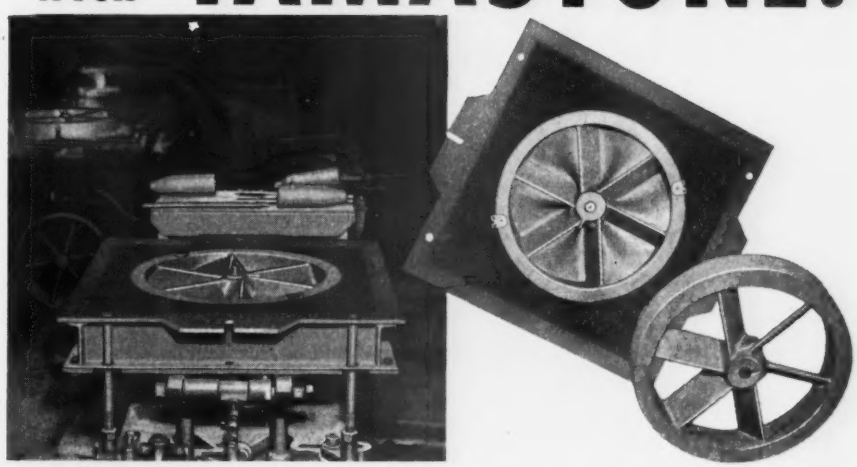

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in this group check the machining that is necessary to meet customers' specifications. Any deviations from allowable tolerances must be traced to the offending machine or operations so that such deviations may be remedied.

Before the finished castings are packed for shipment, a final inspection is made to eliminate any defects that will not be acceptable to the customer. The finished castings also are checked to assure that all final dimensions are within allowable limits. Jigs and gages of the "go-no-go" variety greatly facilitate dimensional inspections. These gages must be checked regularly and kept in perfect order.

Any defects found on final inspection must be brought to the attention of the proper inspector. Final inspection serves as a co-ordinating point for all inspections made in the plant. This department must insure that no important points are overlooked, but at the same time keep duplication of inspection effort to a minimum.

The routine casting and testing of test bars is not generally necessary in producing aluminum die castings. Ordinarily, conformity of the alloys with the specified composition will assure the attainment of acceptable mechanical properties in die castings of correct design. Therefore, all that usually is necessary is to run periodic analyses of the metal.

In the production of highly stressed castings, it may prove desirable to perform breakdown tests on a certain percentage of the production. The nature of these tests, where they are required, should be determined in advance so that their cost may be included in the total cost estimate.

X-ray inspection is used to only a limited extent in aluminum die casting. During the development of a new design and when a new die is first placed in operation, X-ray examination will aid in indicating any necessary changes in either design or operating procedure to minimize porosity. X-ray inspection may prove helpful too in tracing the source of any excess porosity that may develop during a production run. Fluoroscopic examination may be used instead of x-ray inspection. It is somewhat simpler to use and is cheaper, but is less sensitive than x-ray and does not provide a permanent record.

When a highly stressed casting of a new design is being developed, it is sometimes helpful to make a few test sand castings of the piece, using an alloy having properties similar to those of the die-casting alloy se-

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lected. These test castings may then be subjected to breakdown tests and changes in the design easily made before the die is constructed.

Die castings required to be pressure-tight usually are pressure tested by the customer after all machining and finishing operations are completed. It may be desirable, however, for the producer to pressure-test castings selected at periodic intervals. All that this requires is a jig or fixture with quick closing clamps by means of which all openings in the casting may be tightly sealed. Air pressure then is applied through a suitable connection and the casting either submerged in water or coated with a soap solution. In either case, any bubbles will indicate leaks.

Insure Pressure Tightness

In some cases, impregnation may be necessary to assure pressure-tightness. A solution of sodium silicate is most often used for this purpose. If greater penetration of the impregnant is required, one of the many organic sealants may be used—tung oil, linseed oil or a synthetic resin. Impregnation usually is carried out in pressure vessels; where greater depth of penetration is necessary, pressure-and-vacuum cycles may be employed.

Statistical methods of quality control may readily be applied to die-casting production and some producers are using these methods successfully. Control charts are set up for various operations. These reveal the trends of variables and the amount of later inspection necessary. They also indicate how much defective production may be expected. When the number of defective castings coming through exceeds this value, it is time to look for the source of trouble.

By means of statistical methods, such things as tool life expectancy may be determined within reasonable tolerances. For example, by comparing actual deviations from specified dimensions with charts showing the normal expectancy, inspectors can determine when to eliminate production tools even before they begin to cause rejects.

Where statistical methods of quality control are in successful application, 100 per cent gage inspection is not necessary. In fact, users claim that inspections by these methods are more dependable than 100 per cent inspection by ordinary methods.

Statistical methods have proved useful in many types of manufacturing involving high rates of production, and any die-casting manufacturers who are not familar with these methods and their application to die-casting production would do

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well to consider the possibilities of this highly effective tool as an aid to maintaining uniformly good quality in their own production.

Plant Setup—As the manufacture of die castings is a mass-production process, the arrangement of plant equipment must permit continuous operations to be carried out efficiently. Ample working spaces must be provided around die-casting machines and these must be kept clear of obstructions and materials. All machines must be provided with a supply of molten metal which must be replenished at regular and appropriate intervals. Likewise, there must be facilities for conveying the castings away from the machines on either a continuous or a periodic basis.

Each die-casting machine must have its own reservoir of molten metal which is maintained at the proper temperature for pouring at all times. As already mentioned, gooseneck machines have a built-in reservoir which is usually heated by either oil or gas fuel. Cold-chamber machines have a separate holding furnace for each machine. In many instances, these are either gas or oil fired, but electric holding furnaces of the induction type are becoming more common.

Some large die-casting plants have centrally located melting furnaces with conveyors running through the plant so that molten metal may readily be transported to the individual holding furnaces adjacent to the die-casting machines. Furnaces of the reverberatory type usually are employed, with an overhead monorail system for transporting the molten metal to the various machines. Other plants pour the metal from the melting furnaces into small ingots weighing a pound or less. These are transported in special carriers to the various die-casting machines for direct charging into the holding furnaces.

The sizes of reverberatory furnaces vary from about one-ton capacity to many tons. For the majority of die-casting plants, they should have a capacity of at least 4000 pounds and may range upward to 10,000 pounds or more. The use of iron-pot furnaces for die-casting plants is discouraged because of the trouble that sometimes arises from iron pickup by the aluminum alloys.

Some of the most modern aluminum die-casting plants employ combination melting and holding furnaces of the electric induction type. These units have two reservoirs, one into which ingot and foundry scrap is charged and the other from which molten metal is ladled. Melting channels within the furnace connect the two chambers so that the ladling chamber contains only molten metal at all times. The stirring action of the electric current produces agitation within the charge, holding segregation of alloying elements to a minimum.

Accurate temperature control at all steps of the process is as important in the die-casting of aluminum alloys as in casting by other methods. Metal and die temperatures must be held within close limits. The operation of the machines must be so timed that the castings will be completely solidified before the die is opened.

Operations Controlled Automatically

In many instances automatic, or at least semiautomatic, operation of the die-casting machines is employed. Once the injection mechanism has been tripped, the opening of the die and ejection of the casting, followed by the reclosing of the die, are all controlled automatically. In some instances the withdrawal of cores slides or other movable parts of complicated dies also are controlled automatically. Some cold-chamber machines are even equipped for automatically ladling a predetermined amount of molten metal into the chamber before each shot.

Many modern die-casting plants employ continuously moving overhead conveyors to carry castings to the trimming rooms. In these cases, a visual inspection is made at the machine and the castings passing this inspection are hooked onto the conveyor. Rejects are tossed into tote boxes which are periodically removed to the melting room. Other plants employ tote boxes for both sound castings and rejects.

Metal handling and fluxing procedures for aluminum die-casting alloys are similar to those employed in sand and permanent mold foundries. Good plant housekeeping and general cleanliness pay handsome dividends just as they do in the other types of foundries.

The handling of scrap in die casting plants also is similar to that in sand and permanent mold foundries. Like other castings, a considerable amount of metal is contained in the sprue, gates and runners of die castings. These parts are cut away during the trimming operation and are accumulated for reprocessing in the melting furnaces, as in other foundries. Care must be exercised to keep scrap of the various alloy compositions properly segregated.

The modern die-casting plant for aluminum alloys must include a well

equipped and adequately staffed chemical and metallurgical laboratory. This should contain a complete stock of all necessary chemicals and reagents, spectrographic equipment with standards for each alloy, x-ray and photographic equipment, testing machines to keep a check on the mechanical characteristics, and a good metallurgical microscope.

A word should be said here about the necessity of employing thoroughly trained and experienced operators for the production of aluminum diecastings of uniformly good quality. This is one of the essential elements of the process, for the best and most modern equipment obtainable will not produce quality results without properly qualified personnel. Such operators develop procedures that will turn out optimum production of high quality and follow practices that will promote good housekeeping and safe operation of equipment.

Sources of Illustrations

Figs. 1, 3, 4, 5, 6, 7,—Aluminum Co. of America, Pittsburgh
Fig. 2—Monarch Aluminum Mfg. Co., Cleveland

Electric Metal Makers To Meet June 11-13

Electric Metal Makers Guild will hold its 19th annual meeting, June 11-13, at the Seigniory Club, Montebello, Quebec. Joint sessions of the guild will be addressed by Dr. John Convey, chief of physical metallurgy, Department of Mines, Ottawa, and Dr. David Turnbull, Metallurgical and Ceramic Division, General Electric Co., Schenectady, N. Y. Their respective subjects will be "Canadian Steel —Past, Present, and Future" and "Nucleation, Crystallization, and Solidification of Metals."

J. Lance Rumble, general manager, General Motors Corp., Canada, is the banquet speaker. Watches will be presented to past presidents of the guild at the banquet.

Plans Discussional on Medical Problems

University of Michigan, School of Public Health, Ann Arbor, Mich., is offering a discussional on medical-personal relations in industry May 17-19. Participation is restricted to physicians in charge of industrial medical departments or their appointees, and attendance has been limited to 50. Enrollment fee is $10.

Applications should be addressed to Harry E. Miller, director of continued education at the university. A limited number of rooms are available at the Michigan Union.

A Chronology of. . . . **RADIUM RADIOGRAPHY**

1930— First commercial use of gamma rays; radiograph made of sternpost of cruiser "Chester".

1935— First purchase of radium for industrial radiography by Westinghouse; bought from Radium Chemical Co., Inc.

1938— AFA questionnaire revealed that 8% of steel casting men used radium radiography.

1941— 22% of steel casting men bought, rented, leased or employed radium for radiographic purposes.

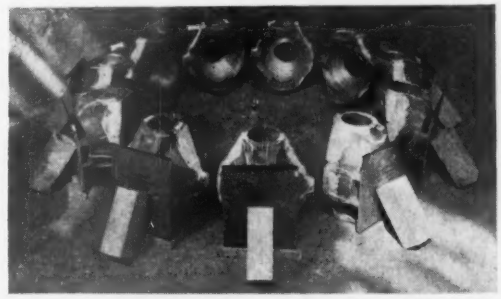
1946— 150 steel foundries rented or leased radium.

1947— American Society for Testing Materials issued Radiographic Standards for Steel Castings. (Gamma Ray). E71-47T.

1948— 200 steel foundries rented or leased radium.

1949— Revision of the U. S. Navy Universal Exposure Calculator for Radium Radiography by N. A. Kahn, E. A. Imbembo and J. Bland, New York Naval Shipyard, Brooklyn, N. Y.

1950— 250 steel foundries rented or leased radium.



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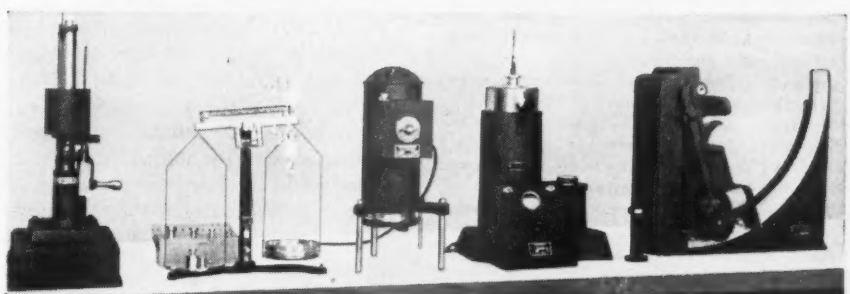

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Baking Oven—Electrically heated, dries sand samples, bakes core specimens.
Moisture Tester—A reliable method of measuring moisture content.
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Malleable Iron Castings

(*Continued from page* 103)

This thought will suggest to the operating management the need of cutting down scatter to a minimum. Statistical quality control, of which the foregoing is a trivial example, is not some fine-haired idea developed by a long-haired mathematician in an ivory tower. It has been used for many years by the Bell Telephone Companies to evaluate the products they buy and during the war formed the basis of acceptance for enormous amounts of ordnance materiel.

There is a growing tendency to utilize pearlitic malleable for many purposes instead of the original orthodox product. There are about as many kinds of pearlitic malleable as there are manufacturers, and it forms no useful part of the present discussion to consider the differences between them. They all differ among themselves with regard to tensile strength, elongation and machinability. They are all decidedly stronger than ordinary malleable iron, and decidedly lower in elongation and are more difficult to machine. They are used to take advantage of the castability of malleable iron while still attaining some of the advantages of a greater strength. An enormous amount of this material is used which does, in fact, have an elongation averaging perhaps 5 or 6 per cent. Failures under impact of properly made material are virtually unknown.

Little Learning Dangerous

It may not be at all inappropriate to warn against the blind use of some determinable mechanical criterion as a guide to what constitutes the best material of construction. It is very easy for a purchasing agent to say that he wants the strongest or most ductile material, and it is very easy for salesmen to agree with him. Unfortunately, the problem of a materials engineer is not nearly so simple.

Almost never does anyone outside the engineering laboratory have a lot of data on acceptable vs. unacceptable results, and only on this basis can it be decided whether any given property is important in determining the utility of a metal for a given part.

It could easily be shown that some products have been used in very critical applications where no guarantee as to given mechanical properties existed and where the properties are such that it is quite certain the purchaser would not have bought the material in the face of the record. This is not a case of ignorance being bliss but an instance of a little learning being a dangerous thing.

An instance where the greater strength of pearlitic malleable frequently suggests its use as compared with ordinary malleable iron, is where press fits are involved. Having a relatively low yield strength, as compared with the pearlitic variety, malleable iron is likely to yield and flow, taking a permanent set under loads imposed in making the forced fits or occurring in subsequent service. As a result the forced fit becomes loose. This is much less likely to occur in pearlitic malleable in view of its higher yield strength.

An analogous case is where keyways or splines are involved. The impact on the side of a keyway in malleable iron is often sufficient in use to compress the metal, destroying the sideways fit of the key and permitting motion of the shaft and malleable part. Here again the greater hardness associated with the greater strength of pearlitic malleable will frequently avoid this difficulty.

RECORD IS BROKEN: Longest safety record in the history of Hamilton Foundry & Machine Co., Hamilton, O., recently was broken by two lost-time accidents on consecutive days—Jan. 23 and 24. The safety record board shown above is draped in black crepe in mourning for the broken record

It is sometimes alleged that the long annealing cycle of the malleable foundry is an economic handicap. This viewpoint is usually over-rated, particularly by the consumer who wants to beat the price down by telling the foundryman that he should overcome this difficulty. So far, contact with the sales department of the author's company has not elicited a single instance where a consumer thought that a shorter annealing cycle was worth any more money to him to the extent that he would be willing

to pay any differential if the annealing cycle were reduced. It should be remembered that the cost of annealing consists of three major items: Labor cost of handling the castings; cost of the energy for heating the furnace and the castings, and an overhead for use of buildings and equipment.

Whatever the annealing cycle in a given type of furnace, the labor cost is the same. The energy required to heat the castings and furnace, including pots if they are used, is the same whether the cycle is long or short. The only economy in heat resulting from the short cycle is the elimination of the radiation loss of the furnace in the extra time. In well insulated furnaces this is a very small feature of cost. The carrying charge on furnaces and pots may perhaps be considered as proportional to the length of the cycle. Very commonly short cycle furnaces involve a considerably greater investment per ton of annealing capacity than long cycle furnaces, which may increase the carrying charge for a short cycle above that for a long cycle.

Short Cycle Offers Advantages

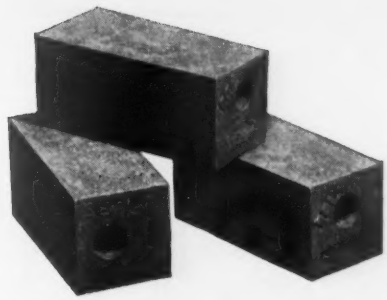
All this is not to say that annealing economies have not been produced by engineering methods involving shorter cycles. The problem, however, originally represented a complete rearrangement of annealing facilities to take advantage not only of some benefits of short cycles but also of the possibility of eliminating labor in connection with the process. For example, changing to a furnace with some form of atmospheric control may eliminate pots to commercial advantage.

While our annealing cycle is probably not a handicap to the use of malleable iron, the fact that the material cannot be welded may be regarded as such. Welding is, of course, possible if confined to small areas which are neither highly stressed nor highly deformed, but in general malleable iron is not a very useful material where welding assembly is contemplated. Unfortunately, there seems to be little hope of overcoming this disadvantage—except, of course, by low temperature brazing because it resides deep down in the very nature of malleable iron's metallurgy. Pearlitic malleable does not suffer from the same difficulty.

The fact that malleable iron cannot be used above about 1250° F for fear that some of the carbon will recombine should not be an important handicap because at such temperatures most of the other unalloyed iron products begin to scale in con-

(*Continued on page* 238)

AVOID COSTLY SHUTDOWNS



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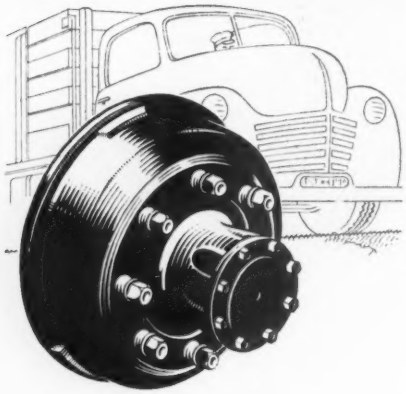

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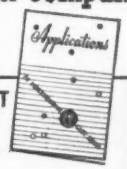

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(*Continued from page 237*)

tinued use.

We have already seen that when malleable iron is heated sufficiently, some of the carbon recombines. By quick cooling the metal in which this has occurred can be rendered quite hard, almost as hard as tool steel. This renders the material useful for flame or induction hardening. It has been found that the solution of the combined carbon of pearlitic malleable takes place faster than the recombination and solution of orthodox malleable. Hence, where it is not essential to maintain the high ductility of the unheat-treated part of the object, the pearlitic malleables lend themselves better to local hardening of either type than ordinary malleable.

It is frequently and correctly stated that malleable iron resists atmospheric corrosion very well. This is much more true of the original surfaces than of finished surfaces, and it is true only under mildly corrosive conditions. These conditions may be as severe as contact with quite warm sulphur-bearing flue gases. However, the material should not be sold as being particularly acid-resistant or heat-resistant. There are good reasons why these fields should be left to the stainless steels. Atmospheric corrosion or water corrosion of malleable iron can be somewhat decreased by the addition of perhaps ¼ per cent or less of copper.

Material Nonresistant to Friction

The use of malleable iron where unlubricated friction is involved is to be frowned upon. The material is intended to be so soft that it will seize and gall under dry friction.

In connection with annealing time, to which attention already has been given, it may be well to point out that the chemical conditions which promote quick annealing also promote mottling. It is, therefore, obviously true that the danger of mottling, which is the greatest single hazard in the manufacture of malleable iron, is increased when efforts are made to reduce the annealing time. For castings of a given cross section—that is, cooling rate—there is a limiting composition which will avoid mottling. More silicon and carbon are permissible for small castings than for large ones. Other things being equal, annealing rates depend mainly on silicon content. Therefore, inevitably the composition suited to the making of thick castings will anneal more slowly than the composition suited to thin castings. Cooling rate itself alters the rate of annealing, slow cooling being the unfavorable condition in the mold.

Without wishing to minimize the late Prof. Touceda's contributions to the metallurgy of malleable iron, his statements that thick castings will anneal as fast as thin ones are definitely erroneous since he failed to consider these differences in composition, and particularly in cooling rate.

Some members of the industry have chosen to select as their fields of production, castings whose size and shape is such as to tolerate high silicon and carbon content and thus obtain quick annealing. If this practice be followed by the industry in general it will exclude from the industry as a whole some of the larger castings which we should retain in the malleable iron field.

Take Leaf from Welder's Book

There remains for consideration another field worthy of at least passing comment. This represents competition from the field of welded assemblies with castings in general and malleable castings in particular. Welding engineers did a most admirable job in redesigning various objects previously cast to adapt the resulting structures to production by welding from standard shapes. The claim that the savings are due to welding is, however, not always, or even generally justified. The savings were due to better engineering design, from the welding engineer's viewpoint. Foundrymen may take a leaf from the welder's book. Instead of resting content with any design of castings submitted to him, he should study very intensively the possibility of making a part performing the desired functions but not necessarily of the same shape as that proposed, which part will lend itself to production by casting. The esthetic quality of the product is nearly always higher when a casting is used than when a functional weldment is substituted.

The weight factor is not always favorable to the weldment as its proponents would have us believe. Where a weldment involves forging and machining is to be done, or indeed where forgings are considered in competition with castings, it is almost universally true that castings can be made requiring less finishing in the machine shop than the forgings, and in the case of our own product the machinability, as such, is also much better. This aspect of the forging competition was quite forcibly brought to the author's attention by a recent piece of advertising showing a forging which had been substituted for a casting, which included also the statement that it was very difficult to produce this forging and much highly specialized skill was required to produce the desired result. Inci-

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dentally, the forging was a hub, which in the foundry would represent no more than ordinary foundry difficulty.

Expressing the properties of an engineering material in terms of such mechanical properties as tensile strength, yield strength, elongation, reduction of area, brinell number, endurance limit, or what have you, is certainly necessary when discussing certain applications with the designing engineer or the purchasing agent. It is to be always remembered, however, that the inter-relationship of these products is complex and no one, and perhaps no combination of the usual reported properties, can be used as an absolute means of evaluating suitability of a material for a given purpose. Something equivalent to a test, service or otherwise, of a part manufactured of a given material, should always follow.

Use the well known mechanical properties as a guide of the purchaser in encouraging him to adopt our material, but do not assume in composition that it is always necessary to meet every specified property which the purchaser may imagine. The writer knows of one instance where an important user felt that a given elongation was necessary for his purpose. Without guaranteeing physical properties but with assurance that a certain material would be useful, he was persuaded to use, in very large amount, a material having about 4/5 the ductility that he thought he needed. Under very severe conditions critically observed, no failures were ever encountered in the substituted material.

Sell a product and not a set of specified values, and particularly do not, in our industry, sell an analysis.

Whiting Men's Club Dinner

Fifteenth annual dinner of the Men's Club, Whiting Corp., Harvey, Ill., was given by the company, Jan. 11, at the Del Prado Hotel, Chicago. Stevens H. Hammond, company president, acted as toastmaster and introduced Brig. Gen. James Mess, president, Whiting Corp. of Canada, who summarized relationship between United States, Canada and England. Allen H. Mogensen explained the company's new work simplification program.

The following Men's Club officers, elected at the December meeting, were installed: R. F. Rice, chairman; Harry Eaton, vice chairman; John Duffy, secretary-treasurer; and Robert Russell, Leo Schmid and Andy Winterbauer, directors.

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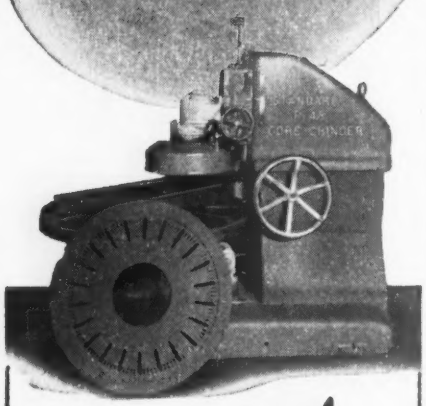

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...TRADE PUBLICATIONS...

For More Details on these Items Use Reply Card—Page 211

CENTRIFUGAL CASTING: Lebanon Steel Foundry, First Ave. & Lehman St., Lebanon, Pa.—Leaflet incorporates information on modern techniques of centrifugal casting in permanent molds for improved and expanded production of cylindrical shapes in a variety of alloy steels. Reference tables listing a large number of experience-proven alloy compositions are supplemented by drawings, charts, and product photographs, with sections devoted to process, properties, design factors, applications, and advantages.
For More Details Circle No. 90—Page 211

HYDRAULICS: Miller Motor Co., 4025-33 North Kedzie Ave., Chicago 18—Publication, "Hydraulic Standards for Industrial Equipment," incorporates all changes and additions made at the most recent meeting of the Joint Industry Conference on Hydraulics. Included are a sample circuit, glossary of terms, standard symbols, information on piston and rod seals for different applications, and a cut-away illustration showing a company cylinder.
For More Details Circle No. 91—Page 211

BRUSHES: Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14—Catalog 210 illustrates industrial brushing operations and describes company's complete line of power, paint, varnish and maintenance brushes. Tips on selecting the correct brush for specific jobs, including operating equipment requirements, brush characteristics and operating conditions, are included.
For More Details Circle No. 92—Page 211

FORK TRUCKS: Baker-Raulang Co., Baker Industrial Truck Division, 1250 West 80th St., Cleveland 2—Bulletin 1324 on 3000 and 4000-lb capacity fork trucks contains pictures and descriptions of major truck components, dimension drawings showing maneuverability, detailed specifications, and illustrations of attachments for special applications.
For More Details Circle No. 93—Page 211

TELEMETERING: Bristol Co., Waterbury 20, Conn.—Bulletin DM029 contains information on the company's telemeter for remote measurement and automatic control of temperatures, pressures, rates of flow, level of liquids, motion, and various electrical quantities over distances ranging from a few feet to many miles.
For More Details Circle No. 94—Page 211

TURBO COMPRESSORS: Spencer Turbine Co., 503 New Park Ave., Hartford 6, Conn.—Bulletin 126-A provides information on the application of turbo compressors to oil and gas fired equipment used in heat treating, agitation, cooling, drying, gas boosters and pneumatic tube systems. Performance curves and tables of capacities for both vacuum and pressure applications are included.
For More Details Circle No. 95—Page 211

AIR CONDITIONING: Surface Combustion Corp., 2375 Dorr St., P. O. Box 907, Toledo 1, O.—"The Humidity Engineer," published periodically, is intended to provide up-to-date information on engineering developments in air conditioning. Comfort conditioning and industrial processing applications are covered.
For More Details Circle No. 96—Page 211

SERVICE AWARDS: American Emblem Co., P. O. Box T116, Utica, N. Y.—Booklet entitled "How Service Awards Promote Loyalty" reproduces in color a wide variety of pin and button awards which are a part of loyalty building programs of leading industrial, business and institutional organizations.
For More Details Circle No. 97—Page 211

EFFICIENCY: Work-Factor Co., 366 Madison Ave., New York 17—Booklet describes four basic ways to increase industrial production through control of indirect expenses, positive inventory control, full utilization of direct labor, and efficient use of production equipment, and plant layout.
For More Details Circle No. 98—Page 211

PRODUCTION CONTROL: Remington Rand Inc., 315 Fourth Ave., New York 10—Booklet TM-596 shows how punched card methods are used for every phase of production control, including engineering records and procedures, production and forecastings, materials controls scheduling, and progress reports.
For More Details Circle No. 99—Page 211

BLOWERS: Standard Stoker Co., 370 Lexington Ave., New York 17—Publication 88 provides dimensional information including engineering layout, typical application data, design data, blower number and rated capacities at various speeds on the company's line of blowers.
For More Details Circle No. 100—Page 211

TRUCK ACCESSORIES: Towmotor Corp., 1226 East 152nd St., Cleveland 10—Folder illustrates and describes lift truck accessories for handling unusual materials and special types of loads.
For More Details Circle No. 101—Page 211

LIGHTING UNITS: RLM Standards Institute, 326 West Madison St., Chicago 6—Bulletin 1050 gives a complete listing of all RLM manufacturers and the RLM certified lighting equipment made by each.
For More Details Circle No. 102—Page 211

HYDRAULIC FLUIDS: Union Carbide & Carbon Corp., Carbide & Carbon Chemicals Division, 30 East 42nd St., New York 17—Booklet pre-

sents physical properties, advantages, and how-to-use information on fire resistant hydraulic fluids. One of the uses of these fluids is in die-casting machines.

For More Details Circle No. 103—Page 211

PRECISION CASTING: Microstat Division, Austenal Laboratories Inc., 715 East 69th Place, Chicago 37—Brochure presents eight case histories, showing how production of various parts by the company's investment casting process has resulted in certain claimed benefits.

For More Details Circle No. 104—Page 211

HOISTS: Ohio Hoist & Mfg. Co., Broadway & Henry Sts., Cleveland 5—Illustrated catalog covering heavy-duty electric cable hoists, gives detailed specifications on 1 to 5-ton models and lists lifting capacities, heights, lifting speeds, weights, overall dimensions and other data.

For More Details Circle No. 105—Page 211

FLOOR RESURFACING: Paramount Industrial Products Co. University Center Station, Cleveland 6—Information sheet L-3734 deals with the company's plastic floor resurfacing material for indoor or outdoor use, also application methods.

For More Details Circle No. 106—Page 211

TESTING MACHINES: Tinius Olsen Testing Machine Co., 1118 Easton Rd., Willow Grove, Pa.—Bulletin 40 describes a line of hydraulic machines for tension compression, transverse, and flexure testing in capacities of 60,000, 120,000, 200,000, 300,000 and 400,000 lb.

For More Details Circle No. 107—Page 211

SAND RECLAMATION: Nichols Engineering & Research Corp., 70 Pine St., New York 5—Bulletin 222 describes sand reclamation systems and data covering present plant operation. Advantages of two types of reclamation systems are discussed.

For More Details Circle No. 108—Page 211

LUBRICATING GRAPHITE: United States Graphite Co., 1621 Holland St., Saginaw, Mich.—Bulletin G-1 describes a lubricating graphite and discusses its use as a lubricant and protective coating in many applications.

For More Details Circle No. 109—Page 211

HARDNESS TESTER: Newage International Inc., 521 Fifth Ave., New York 17—Bulletin ET gives principles of operation, advantages and applications of a portable, direct reading hardness tester for all types of metals.

For More Details Circle No. 110—Page 211

ADJUSTABLE DOCKS: Rowe Methods Inc., 1743 East 25th St., Cleveland 14—Folder gives information on design, construction, and use of adjustable loading docks. Typical installations are illustrated.

For More Details Circle No. 111—Page 211

PARTING COMPOUND: Acheson Colloids Corp., Port Huron, Mich.—Bulletin 427 describes use of colloidal graphite dispersions as a parting compound.

For More Details Circle No. 112—Page 211

42 YEARS of DISTINGUISHED SERVICE in action

The record speaks for itself! Dependable time-proven Buffalo Brand Vent Wax provides clean, sure vents in intricate cores for leading foundries everywhere. True 42 years ago, true today. Safe — Sure — Low Cost. Write for sample.

UNITED COMPOUND CO.
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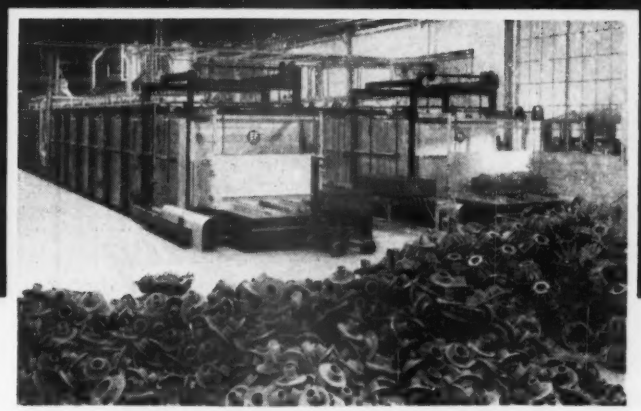
EF MALLEABLE FURNACES



shorten the cycle from days to hours

● Packing in pots is entirely eliminated, reducing the fuel requirement — the labor cost and improving working conditions. The tonnage tied up in production is much reduced, speeding deliveries. You'll get a better, more uniform, and scale free product — in shorter time — at lower cost. Continuous or batch types. We build furnaces for *every* annealing and heat treating requirement.

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GAS FIRED, OIL FIRED AND ELECTRIC FURNACES FOR ANY PROCESS, PRODUCT OR PRODUCTION
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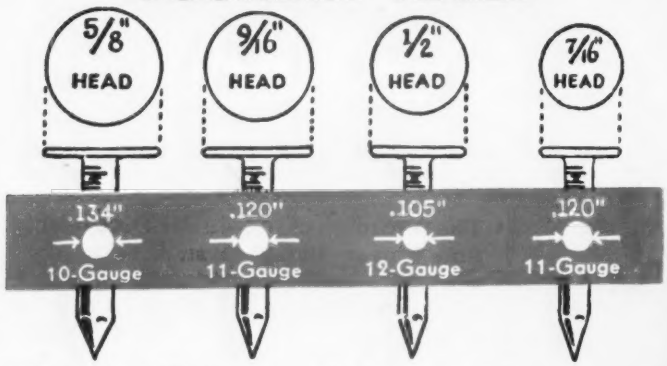

5/8", 9/16" & 1/2" Heads available up to 3 inches in length

Standard Foundry Nails available in all lengths.

All styles of Chaplets Accurately Made for Better Castings

THE ANGELL NAIL & Chaplet Company

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CMC

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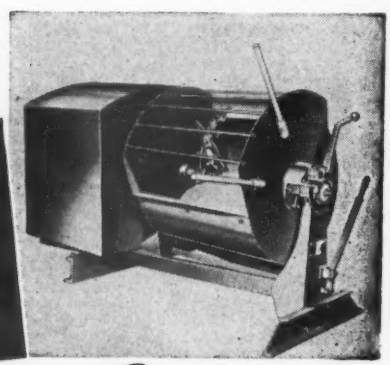

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EXCLUSIVE TRIPLE MIXING HOES . . .

Tops in the field! Triple mixing Hoes have adjustable blades . . . easily set for correct clearance. Mixing is *thorough* and "end to end". Advance CMC design makes charging and discharging *easier than ever before!* 6 cu. ft. capacity shown. Write today for full details.

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Easily replaceable, full - hard abrasion resistant alloy steel drum liners are your assurance of lowest upkeep and minimum operating costs.

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For low cost cleaning

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- AMASTEEL assures the lowest cleaning cost.
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Abrasive for any and all kinds of work.

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HARD CHROMED • PORTABLE PNEUMATIC TOOLS

DO MORE WORK AT LESS COST
because they deliver more power per cubic foot of air consumed, are light in weight for easier maneuverability and they retain their new tool power longer.

ARE PREFERRED BY OPERATORS
because they are lighter in weight, better balanced and designed to reduce shock and be free from vibration.

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CORE WORK, SAND FACINGS, SPRAYS

Write for pamphlets giving detailed information. Both materials carried in stock by America's foremost foundry jobbers

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(Established 1905)

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SERVING YOU
in
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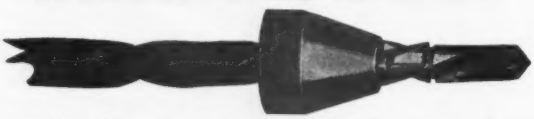
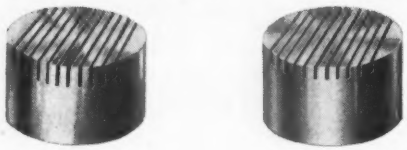
INSERTING DRILL



• Uniformity of holes • Faster insertion of vent • Correct Depth

CORE BOX VENTS



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SHALLOW HEAD Wide or Narrow Slots .014 .010

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Made of Tempered Steel, Easy to Use

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Any operator can quickly determine temperatures of minute spots, fast-moving objects and smallest streams with the simplified PYRO Optical Pyrometer. Completely self-contained—no calibration charts or accessories needed. An accurate, DIRECT-READING instrument that will pay for itself many times over by helping prevent spoilage. Weighs just 3 lbs. Available in 5 ranges (1400° to 7500° F.) *Write for FREE CATALOG #80, today!*

For Non-Ferrous Foundries . . . the PYRO IMMERSION PYROMETER

Helps insure low-cost production of SOUND, UNIFORM Castings. Has shielded steel housing which is shock-proof, dust-proof and moisture-proof—withstands roughest handling. "Protected Type" and "Bare Metal" thermocouples are instantly interchangeable, without adjustment or recalibration. Large 4-inch easy-reading dial. Equipped with exclusive LOCK SWIVEL. Ranges: 1-1500° and 0-2500° F. *Write for FREE Catalog #150*

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FASTER AND BETTER
with the
MURPHY PISTOL SPRAYER
ELIMINATES SWAB, BRUSH and SPRAY CAN

BLACKENING REACHES HIDDEN POCKETS
MOLDS ARE BLACKENED FASTER
CASTINGS PEEL BETTER
WORK COMES CLEANER
Satisfactory Performance Guaranteed or Money Back!

PRICES COMPLETE WITH SUCTION HOSE AND SINKER

PIPE SIZE	1/16"	1/8"	1/4"	3/8"	1/2"
PRICE F. O. B. HAMILTON, O.	$12.00	$12.00	$12.00	$14.50	$18.00

Used for Silica wash, oil, water or any liquid material. For sand-blast cleaning. As a blow gun for cleaning motors and machinery. If your dealer cannot supply you at once, order direct from manufacturer below. Literature on request.

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AFTERCOOLERS • SEPARATORS • STRAINERS • TRAPS
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FIFTH AND VINE STREETS, HAMILTON, OHIO
Moisture Elimination Up To 3000 Pounds Per Square Inch

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JOLT SQUEEZER

This portable jolt squeezer is furnished in two sizes: 10" squeeze cylinder with 3" jolt cylinder and 12" squeeze cylinder with 4" jolt cylinder.

The post and squeeze cylinder are cast in one piece. Top of post machined to take 2-7/16" cold rolled shaft for the swing arm. Zerk fittings throughout.

No bolts or screws in this machine!

FULLY EQUIPPED

Equipped with air gauge, pop-off gauge and pin for gate horn.

The price will interest you!

HAYNES FOUNDRY EQUIPMENT CO.
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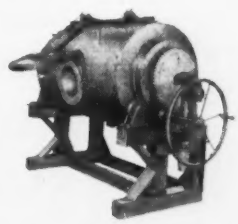
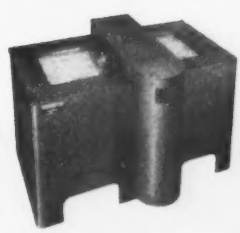
LADLES—BRASS FURNACES—CORE OVENS

FOR EVERY MELTING AND HOLDING NEED

Lindberg-Fisher builds all kinds of melting and holding equipment . . . gas . . . oil . . . electric . . . induction . . . arc and high frequency. Lindberg-Fisher engineers can intelligently and without prejudice recommend the proper type of furnace to best suit your needs and conditions.





WRITE NOW FOR BULLETIN 551—
Twelve pages of specific data telling sizes, capacities, construction details and the primary applications of the complete line.

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A division of Lindberg Engineering Co.
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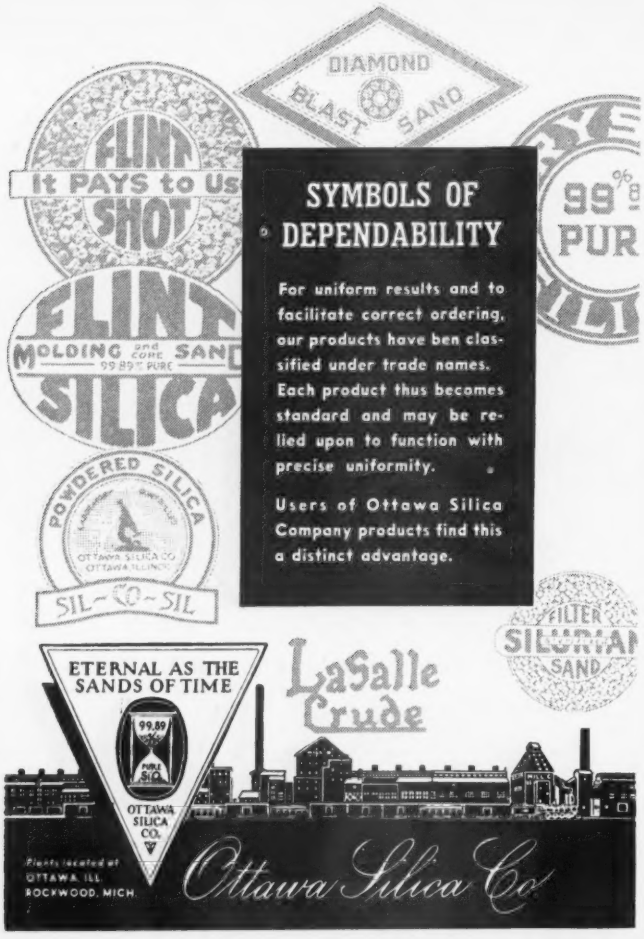
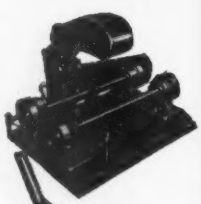


CENTRIFUGAL CASTING MACHINES

Model AS

Model J



Model M

Model J-P

These machines used to make ferrous and non-ferrous centrifugal castings are produced by the pioneer manufacturer of such equipment.

They are made in a large variety of styles and a wide range of sizes. Complete technical information is supplied concerning sand and permanent mold design, gating, sand mixes, speeds, etc.

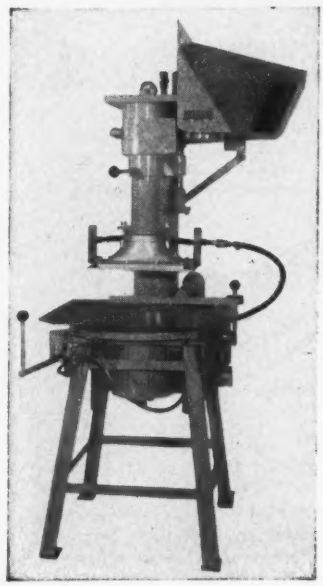
Send us drawings or sketches of parts you are interested in casting centrifugally, and we will tell you, without obligation, if and how our machines can cast them faster, cleaner and with fewer rejects.

CENTRIFUGAL CASTING MACHINE COMPANY

Nathan Janco, *President*

P. O. Box 947 Tulsa 1, Okla.

COR-BLO AUTOMATIC



HIGH DRAW MODEL "C-H-E"

Cores up to 8 lbs.

With the operation of one lever on the hand machine, or pushing of one button on the electric cycle, this machine will —Close the Core Box—Blow the Cores—Vibrate the Box—Draw the Cores—and Eject the Core Box to position where the dryer is applied. Produces more cores with less operator fatigue, and more cores per hour.

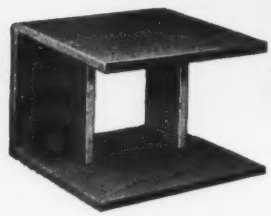
Let us figure on your requirements.

HARRISON MACHINE COMPANY

Wesleyville, Erie, Pa.

BUFFALO "Double Angle" CHAPLETS

★ Greater Strength
★ Burn in more easily
★ Less Chilling



The extra strength of this exclusive *Angle Design* (originated and patented by Combined Supply and Equipment Co.) permits the use of these Buffalo Chaplets in thinner gauges.

Direct advantages are the ability to burn in more easily and a greater resistance to chilling.

Thorough coating promotes immediate fusion with the molten metal.

Your requirements may be met with Buffalo "Angle Stem" (Single) or "Double Angle" Chaplets, in a range of four metal gauges. Complete information, samples and prices promptly furnished.

CATALOG NO. 15 MAILED ON REQUEST
Contains useful data on complete line of chaplets

Combined SUPPLY & EQUIPMENT CO., INC.
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No. 4 DAYTON RING VALVE BENCH RAMMER

MORE POWER—MORE SPEED

You'll get more production with these faster, more powerful rammers and at the same time substantially reduce maintenance costs.

The Valve Units will last for years. The Cylinder Bores and Piston Rods are HARD CHROME PLATED which doubles the life of the Rammer. Many of the largest foundries in the country have already adopted them as standard. Made in six sizes to meet every requirement.

Send for Bulletin 300

DAYTON PNEUMATIC TOOL CO.

Manufacturers of Pneumatic Tools Since 1903

DAYTON, OHIO

PRECISION CORE BOX VENTS

You can depend on the quality that is built into every Demmler Core Box Vent. All orders are promptly filled from stock.

SLOTTED VENTS
(Available in Brass or Steel)
Slot Widths: .010", .013", .015"
Diameters: 1/8", 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8" 1", 1 1/4", 1 1/2"

STAINLESS STEEL SCREEN VENTS
Mesh: #30, #40, #50
Diameters: 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8", 1", 1 1/4", 1 1/2"

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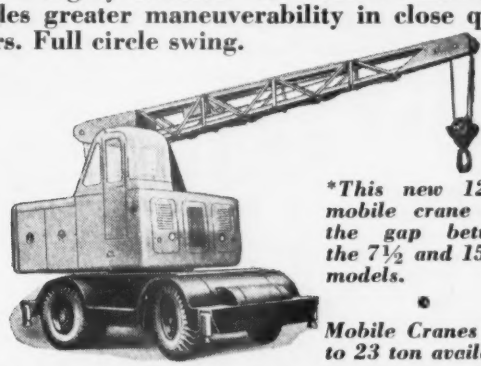
Wm. DEMMLER & Bros.
Kewanee, Illinois

7½ Ton Coles Crane with Magnet

NO LOST MOTION IN A MINIMUM OF SPACE!

• COLES CRANES 100% concentration on operation is a result of grouped finger-tip controls. The proximity of the crane is made possible by the cantilever type boom mounted on a highly situated "A" frame which provides greater maneuverability in close quarters. Full circle swing.



**This new 12-ton mobile crane fills the gap between the 7½ and 15 ton models.*

Mobile Cranes 1¾ to 23 ton available.

• When you consider all around *SAFETY, LOW INITIAL INVESTMENT, LOW OPERATING COST, REDUCED MAINTENANCE COST, MINIMUM YARD SPACE* . . . plus many other advantages—it is no wonder why COLES Mobile Cranes are the first choice among leaders all over the world. We invite comparison.

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COLES CRANES, INC.,
"The name that carries weight in material handling"
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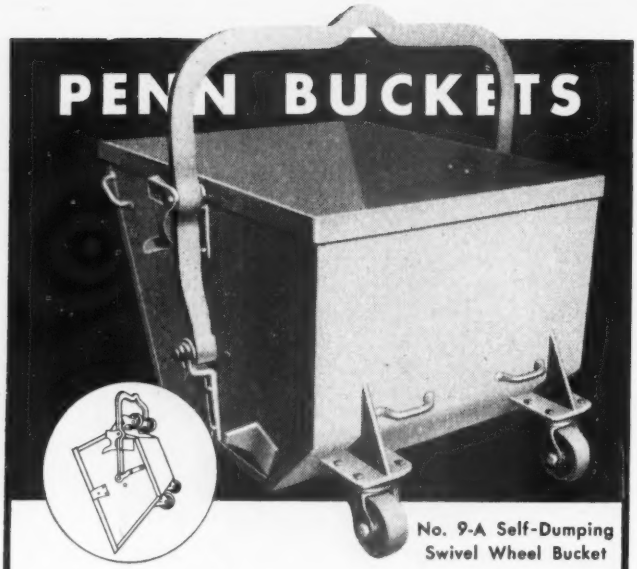
COLES MOBILE CRANES

Designed for Material Handling Engineers.

PENN BUCKETS



No. 9-A Self-Dumping Swivel Wheel Bucket

Careful balancing makes Penn Buckets self-dumping when loaded and self-righting when empty. Welded construction prevents "clinging", makes them empty easily and completely. The swivel wheels increase handling efficiency, too.

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PENN IRON WORKS, INC.

READING, PENNA.

Reduce Use of Chills in Gray Iron Casting

Now all you have to do to get hard chilled iron is add

TELLURIUM

Comes in 1, 2, 3 and 4-gram tablets; also in powder, slabs and sticks. For full information, write Dept. LM for 8-page article. "Use of TELLURIUM In Promoting Chills On Gray Iron Castings."

American Smelting and Refining Company

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CORE SANDS
MOLDING SANDS
CUPOLA PATCH MIXES

IN 4 MINUTES FLAT

THEN *DISCHARGE 'EM* IN THIRTY SECONDS

Lower Costs? YOU BET!

It's the new PERFECT MIX MULTIMIXER that kneads, as it turns, as it rubs to give you the most modern equipment of its kind on the market today for better cores—better castings. Sizes from 3 to 60 cu. ft. Hundreds of units in operation. Direct motor drive—no clutch—no belts. A real time saver—cost cutter.

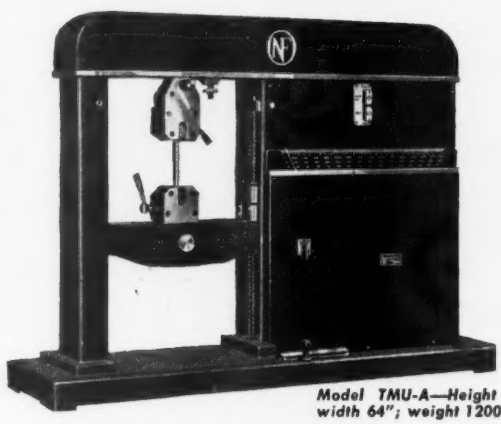
Sold only through nationally known foundry and equipment dealers. Consult your supply dealer or write direct.

MULTIPLEX MACHINERY CORP. ELMORE OHIO

It Will Pay to Make Your Own Tests with

NATIONAL FORGE

UNIVERSAL TESTING UNITS



Model TMU-A—Height 44"; width 64"; weight 1200 lbs.

The National Forge Universal Testing Machine, Model TMU, is compact, accurate, dependable, easy to operate and moderately-priced.

Wide working clearances, long stroke, quick-action simplified variable-speed control, improved grips and a wide spread of load scale ranges adapt this modern, streamlined unit to production, research or school instruction tests of a great variety of materials and specimen sizes. A.S.T.M. accuracy requirements are guaranteed.

Three load scale ranges: Model TMU-A—0-30,000, 0-6000, 0-600 lbs. Model TMU-B—0-15,000, 0-3000, 0-300 lbs.

Prompt deliveries of few units remaining in stock.

For details, write for Brochure 501.

TESTING MACHINE DIVISION

NATIONAL FORGE & ORDNANCE COMPANY

Dept. F, Irvine, Warren County, Penna.

REDUCED CASTING REJECTS plus LABOR SAVING—

The Pay-Off FOR USING THIS PATENTED SHOULDER OPEN HEAD RADIATOR CHAPLET

because

the exclusive design permits you to pack sand SOUNDLY under the head and around stem—and obtain better support for your cores.

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CLEVELAND CHAPLET & MFG. CO.
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We also make MOTOR CHAPLETS

BOILER CHAPLETS, FORGED HEAD CHAPLETS, FITTED HEAD CHAPLETS, DOUBLE HEAD CHAPLETS and other types.

CLEVELAND CHAPLETS

"OLIVER"
No. 12 Heavy Duty Hand Planer and JOINTER

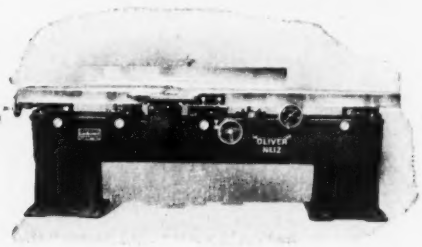
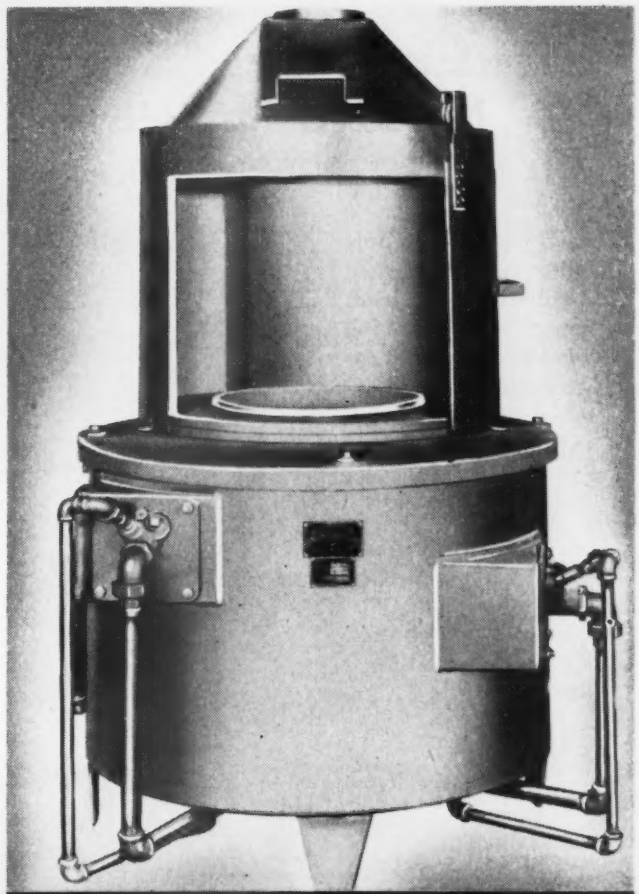


Table tilts 5 degrees for planing draft on pattern lumber

This "Oliver" Jointer makes easy work of planing long and short pieces of lumber, taking them out-of-wind, and making perfect glue joints. Tables adjustable for ¾" cut. Fence adjustable from square to 45° across table. Has rabbeting attachment. Balanced, quiet-running cylinder carries 3 or 4 knives. Sturdy cabinet columns dispel vibration, and provide footroom for operator. Three types of motor-drive—shaftless, coupled, belted. Write for Bulletin No. 12.

"Oliver" Heavy Jointers are made in 5 sizes—12", 16", 20", 24", 30" widths

OLIVER MACHINERY COMPANY
Established 1890 **GRAND RAPIDS 2, MICHIGAN**



HIGH-PRODUCTION HEAT TREATING
Hardening • Carburizing • Nitriding
in ECLIPSE GAS-FIRED
salt pot furnace
with *"ROLL AROUND"* head

Equipped with "PW" Piloted Wall-Tite Burner

Whether you employ lead, cyanide or other salt bath processes, you can heat-treat small parts faster, under better control, and at lower cost, in Eclipse Pot Furnaces. Model illustrated has: 1. Roll-Around Hood for fume disposal and all-around accessibility. 2. Type "PW" Wall-Tite Burner that can be equipped with instantaneous, flame-failure protection and constant pilot, with single valve control (proportioning).

Eclipse Pot Furnaces are available in wide range of sizes for either high or low-pressure gas. Write for Descriptive Bulletins.

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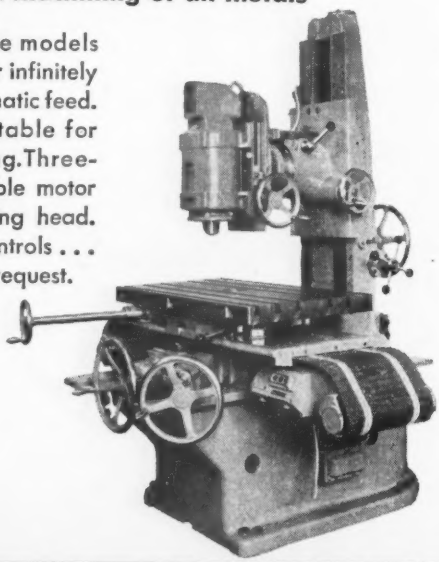
Boke UNIVERSAL HIGH-SPEED

MILLING MACHINES

for precision pattern making and machining of all metals

TWO versatile models with manual or infinitely variable automatic feed. Rotary work-table for circular milling. Three-speed, reversible motor serves as milling head. Convenient controls . . . Particulars on request.



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HAUCK OIL AND GAS BURNING EQUIPMENT

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- CUPOLA LIGHTING
- MOLD DRYING
- LADLE HEATING
- CORE BAKING
- FURNACE HEATING

Compressed air portable oil burner equipment for lighting cupolas and drying molds. Also hand pump types.

Venturi compressed air "suction" hand torches — no preheating, for drying linings, cores, molds.

Portable venturi high pressure oil burners with adjustable burner stand for heating and drying ladles.

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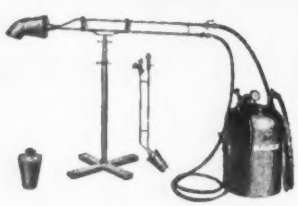
3 BIG OPERATIONS WITH 1 EQUIPMENT



This Hauck All-Purpose Unit with interchangeable Burners and Nozzles, lights cupolas, heats ladles, dries molds. Fast, efficient—easy to handle. Burner flame adjustable and can be directed from any angle. Nothing like it for superior performance. Get Hauck Foundry Catalog.

HAUCK MANUFACTURING CO.

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Venturi low pressure and high pressure air atomizing oil burners for ladle heating, core and mold ovens, melting and annealing furnaces.

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WESTOVER ENGINEERS

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FOUNDRY MANAGEMENT CONSULTANTS

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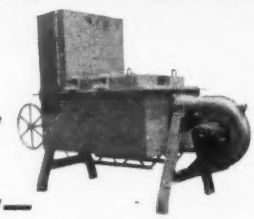

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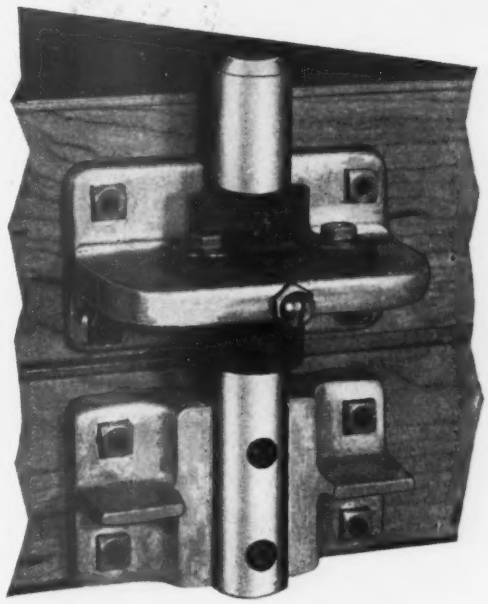

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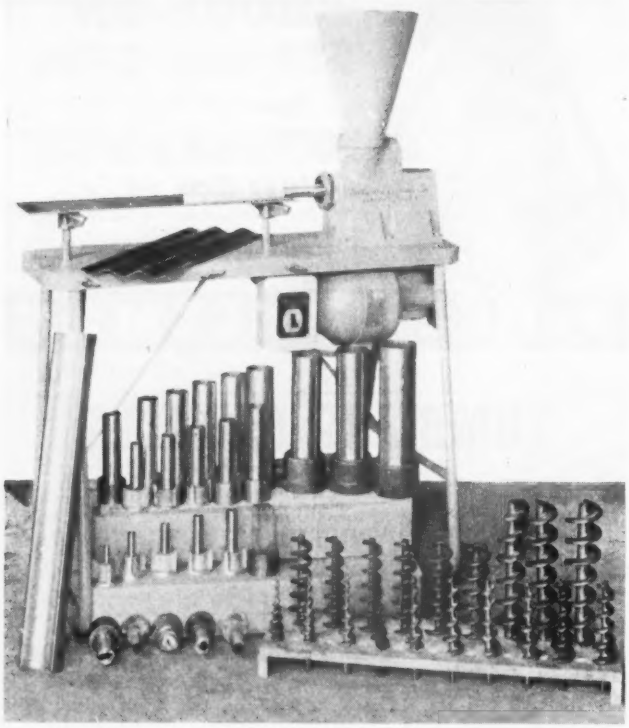

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Frank G. Hough Co., Libertyville, Ill.

Kwik-Mix Co., Port Washington, Wis.

Prime Mover Co., Muscatine, Iowa.

DUST ARRESTING EQUIPMENT

American Air Filter Co., Inc., 266 Central Ave., Louisville 8, Ky.

American Wheelabrator & Equipment Co., Mishawaka, Ind.

Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, O.

Kirk & Blum Mfg. Co., Cincinnati 9, Ohio.

Pangborn Corp., Hagerstown, Md.

Schneible Co., Claude B., 2827—25th St., Detroit 16, Mich.

W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.

Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

DUST COLLECTORS

American Wheelabrator & Equipment Co., Mishawaka, Ind.

American Air Filter Co., 266 Central Ave., Louisville 8, Ky.

Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland, O.

Kirk & Blum Mfg. Co., Cincinnati 9, Ohio.

Pangborn Corp., Hagerstown, Md.

Claude B. Schneible Co., 2827 25th St., Detroit 16, Mich.

W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.

DUST RECOVERY SYSTEMS

American Wheelabrator & Equip-.. ment Co., Mishawaka, Ind.

Kirk & Blum Mfg. Co., Cincinnati 9, Ohio.

Pangborn Corp., Hagerstown, Md.

DYES & CHEMICALS

Eaton Chemical & Dyestuff Co., 1490 Franklin, Detroit, Mich.

ELECTRIC FURNACES (see Furnaces, Electric)

ELECTRODES (Graphite and Amorphous)

International Graphite & Electrode Corp., St. Marys, Pa.

National Carbon Co., Inc., Electrode Sales Div., 30 E. 42nd St., New York 17, N. Y.

ELEVATORS

Standard Conveyor Co., North St. Paul 9, Minn.

ELEVATORS (Bucket)

Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.

Jeffrey Mfg. Co., Columbus 16, O.

Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

National Engineering Co., 549 W. Washington St., Chicago 6, Ill.

Newaygo Engineering Co., Newaygo, Mich.

Robins Conveyors Div., Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.

ELEVATORS (Pneumatic, Material Handling)

Fuller Co., Catasauqua, Pa.

ENGINEERING SERVICE (Foundry)

H. K. Ferguson, 1783 E. 11th St., Cleveland 14, Ohio.

Giffels & Vallet, Inc., Marquette Bldg., Detroit, Mich.

ENGINEERING SERVICE (Foundry) (Cont'd.)

Lester B. Knight & Associates, Inc., 600 West Jackson Blvd., Chicago 3, Ill.

A. H. Putnam Co., 1319 2nd Ave., Rock Island, Ill.

Westover Engineers, 424 E. Wells St., Milwaukee 2, Wis.

EXHAUST SYSTEMS

American Air Filter Co., Inc., Louisville 8, Ky.

American Wheelabrator & Equipment Co., Mishawaka, Ind.

Kirk & Blum Mfg. Co., Cincinnati 9, Ohio.

Pangborn Corporation, Hagerstown, Md.

Schneible Co., Claude B., 2827 25th St., Detroit 16, Mich.

W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.

FABRICATORS (Metal)

Kirk & Blum Mfg. Co., Cincinnati 9, Ohio.

Roura Iron Works, 1405 Woodland Ave., Detroit 11, Mich.

FACINGS

Acheson Colloids Corp., Port Huron, Mich.

Delta Oil Products Co., Milwaukee 9, Wis.

Joseph Dixon Crucible Co., Monmouth St., Jersey City, N. J.

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

National Carbon Co., Inc., Carbon Products Div., 30 E. 42nd St., New York 17, N. Y.

Stevens Inc., Frederic B., Detroit 16, Mich.

United States Graphite Co., Saginaw, Mich.

FANS (Ventilating, Exhaust, Cooling, etc.)

American Wheelabrator & Equipment Co., Mishawaka, Ind.

Hartzell Propeller Fan Co., Piqua, Ohio

Joy Mfg. Co., La Del Division, New Philadelphia, Ohio.

Pangborn Corp., Hagerstown, Md.

FEEDERS (Rotary)

Fuller Company, Catasauqua, Pa.

Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

Newaygo Engineering Co., Newaygo, Mich.

FEEDERS (Sand)

Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.

Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.

Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

FERROBORON

Electro Metallurgical Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

Molybdenum Corp. of America, Pittsburgh 19, Pa.

FERROCHROME

Electro Metallurgical Div. Union Carbide & Carbon Corp., 30 E. 42nd St. New York 17, N. Y.

Hickman-Williams & Co., Cleveland, O.

Ohio Ferro-Alloys Corp., Canton 2, O.

Vanadium Corp., of America, 420 Lexington Ave., New York, N. Y.

FERROCOLUMBIUM

Electro Metallurgical Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

FERROMANGANESE

Electro Metallurgical Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

Ohio Ferro-Alloys Corp., Canton 2, O.

FERROMOLYBDENUM

Climax Molybdenum Co., 500 Fifth Ave., New York 18, N. Y.

Molybdenum Corporation of America, Pittsburgh 19, Pa.

FERROSILICON

Electro Metallurgical Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

Jackson Iron & Steel Co., Jackson, O.

Keokuk Electro Metals Co., 429 So. 4th St., Keokuk, Iowa.

Miller & Company, 332 S. Michigan Ave., Chicago 4, Ill.

Ohio Ferro-Alloys Corp., Canton 2, O.

Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FERROTITANIUM

Electro Metallurgical Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

Titanium Alloy Mfg. Div., National Lead Co., Hyde Park Blvd., Niagara Falls, N. Y.

Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FERROTUNGSTEN

Electro Metallurgical Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

Molybdenum Corp. of America, Pittsburgh 19, Pa.

FERROVANADIUM

Electro Metallurgical Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FILLET (Leather)

Milwaukee Leather Belting Co., 1114 No. Water St., Milwaukee, Wis.

FILM (X-Ray)

Eastman Kodak Co., Rochester, N. Y.

General Electric X-Ray Corp., 4855 Electric Ave., Milwaukee 14, Wis.

FILTERS (Air)

American Air Filter Co., 266 Central Ave., Louisville 8, Ky.

FIRE BRICK

Babcock & Wilcox Co., 85 Liberty St., New York 6, N. Y.

Carborundum Co., Perth Amboy, N. J.

Electro Refractories & Alloys Corp., Vars Building, Buffalo 2, N. Y.

Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.

FIRE BRICK (Cont'd.)

Illinois Clay Products Co., Joliet, Ill.

Norton Co., Worcester 6, Mass.

Stevens Inc., Frederic B., Detroit 16, Mich.

FIRE CLAY

Eastern Clay Products, Inc., Jackson, O.

Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.

Illinois Clay Products Co., Joliet, Ill.

Ironton Fire Brick Co., Ironton, O.

FIRE SAND

Carborundum Co., Niagara Falls, N. Y.

Cleveland Quarries Co., 1740 E. 12th St., Cleveland 14, O.

FIRESTONE

Cleveland Quarries Co., 1740 E. 12th St., Cleveland 14, O.

FLASK BANDS

Chicago Mfg. & Distributing Co., 1928 W. 16th St., Chicago 9, Ill.

Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

FLASK BUSHINGS

Black, Sivalls & Bryson, Inc., 7500 E. 12th St., Kansas City 6, Mo.

Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.

Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

Universal Engineering Co., Frankenmuth, Mich.

FLASK PINS

Black, Sivalls & Bryson, Inc., 7500 E. 12th St., Kansas City 6, Mo.

Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.

Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

Universal Engineering Co., Frankenmuth, Mich.

V-G Flask & Fitting Co., Box 467, Madison, Conn.

FLASKS (Aluminum, Magnesium)

Adams Co., Dubuque, Iowa.

Diamond Clamp & Flask Co., Richmond, Indiana

Fremont Flask Co., Fremont, O.

Hines Flask Co., 3431 W. 140th St., Cleveland 11, O.

FLASKS (Dowmetal)

Fremont Flask Co., Fremont, O.

Hines Flask Co., 3431 W. 140th St., Cleveland 11, O.

FLASK FILLERS

Bartlett & Snow, C., C., Co., 6201 Harvard Ave., Cleveland 5, O.

Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.

Jeffrey Mfg. Co., Columbus 16, O.

FLASKS (Slip)

Adams Co., Dubuque, Iowa.

Diamond Clamp & Flask Co., Richmond, Ind.

Freeman Supply Co., 1152 East Broadway, Toledo, Ohio.

FLASKS (Slip) (Cont'd.)

Fremont Flask Co., Fremont, O.

Hines Flask Co., 3431 W. 140th St., Cleveland 11, O.

Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.

FLASKS (Snap)

Adams Co., Dubuque, Iowa.

Diamond Clamp & Flask Co., Richmond, Ind.

Fremont Flask Co., Fremont, O.

Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

Stevens, Inc., Frederic B., Detroit 16, Mich.

V-G Flask & Fitting Co., Box 467, Madison, Conn.

FLASKS (Steel)

Black, Sivalls & Bryson, Inc., 7500 E. 12th St., Kansas City 6, Mo.

Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.

Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.

Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

Truscon Steel Co., Pressed Steel Div., 6100 Truscon Ave., Cleveland, Ohio.

FLASK FITTINGS

Adams Co., Dubuque, Iowa.

Black, Sivalls & Bryson, Inc., 7500 E. 12th St., Kansas City 6, Mo.

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.

Truscon Steel Co., Pressed Steel Div., 6100 Truscon Ave., Cleveland, Ohio.

V-G Flask & Fitting Co., Box 467, Madison, Conn.

FLASK LIFT MACHINES

Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.

Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

FLASK LUMBER

Dougherty Lumber Co., 4300 E. 66th St., Cleveland 5, O.

Rietz Lumber Co., 1810 N. Central Park Ave., Chicago, Ill.

FLASKS (Wood)

Adams Co., Dubuque, Iowa.

Chicago Mfg. & Distributing Co., 1928 W. 16th St., Chicago 9, Ill.

Diamond Clamp & Flask Co., Richmond, Ind.

V-G Flask & Fitting Co., Box 467, Madison, Conn.

FLEXIBLE COUPLINGS

Ajax Flexible Coupling Co., Westfield, N. Y.

FLOORING (Non-Slip)

Norton Co., Worcester 6, Mass.

FLUXES

Apex Smelting Co., 2537 West Taylor St., Chicago 12, Ill.

Atlantic Chemical & Metals Co., 1925 N. Kenmore, Chicago 14, Ill.

Cleveland Flux Co., 1026 Main St., Cleveland 13, O.

Mathieson Chemical Corp., Mathieson Bldg., Baltimore 3, Md.

Niagara Falls Smelting & Refining Div., Continental-United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.

FLUXES (Cont'd.)

Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.

Puro-Seal Co., 2323 West Third, Cleveland 13, Ohio.

FLUXES (Soldering, Welding & Tinning)

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

FOUNDRY ENGINEERS

Edwin S. Carman, 1643 Lee Road Cleveland 18, Ohio.

Lester B. Knight & Associates Inc., 600 West Jackson Blvd., Chicago 3, Ill.

A. A. Wickland Co., 205 W. Wacker Dr., Chicago 6, Ill

FOUNDRY LAYOUT & METHODS

H. K. Ferguson Co. 1783 E. 11th St., Cleveland 14, Ohio.

Giffels & Vallet, Inc., Marquette Bldg., Detroit, Mich.

Lester B. Knight & Associates, Inc., 600 West Jackson Blvd., Chicago 3, Ill.

FOUNDRY NAILS

Crescent Brass & Pin Co., 5766 Trumbull Ave., Detroit, Mich

Standard Horse Nail Corp., New Brighton, Pa.

FOUNDRY SHOVELS

(See SHOVELS)

FOUNDRY SUPPLY HOUSES

Combined Supply & Equipment Co., Inc., 215 Chandler St., Buffalo 7, N. Y.

Eastern Clay Products, Inc., Jackson, O.

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O

Foundries Materials Co., Coldwater, Mich.

Stevens, Inc., Frederic B., Detroit 16, Mich.

FURNACES (Aluminum & Magnesium Billets)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.

Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

FURNACES (Aluminum & Magnesium Forgings)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.

Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio

FURNACES (Aluminum Melting)

Ajax Engineering Corp., Trenton, N. J.

Campbell-Hausfeld Co., Harrison, O

Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.

FURNACES (Aluminum Rivet Heating)

Ajax Electric Co., Inc., Philadelphia 23, Pa.

FURNACES (Annealing)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.

Despatch Oven Co., Minneapolis 14, Minn.

FURNACES (Annealing) (Cont'd.)

Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Electric Furnace Co., Salem, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Holcroft & Company, 6545 Epworth Blvd., Detroit 10, Mich.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.

FURNACES (Crucible Melting)

Ajax Electrothermic Corp., Trenton, N. J.
Campbell-Hausfeld Co., 300-320 Moore St., Harrison, O.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Stroman Furnace & Engineering Co., Div. of Peterson Oven Co., 9900 Franklin Ave., Franklin Park, Ill.

FURNACES (Electric Melting)

Ajax Electric Furnace Corp., 46 Richmond St., Philadelphia 23, Pa.
Ajax Electrothermic Corp., Trenton, N. J.
Ajax Engineering Corp., Trenton, N. J.
American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Pittsburgh Lectromelt Furnace Corp., P.O. Box 1125, Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Gas or Oil Fired)

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Campbell-Hausfeld Co., Harrison, O.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Electric Furnace Co., Salem, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Lanly Company, 750 Prospect Ave., Cleveland 15, Ohio.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Reda Pump Co., Bartlesville, Oklahoma
Stroman Furnace & Engineering Co., Div. of Peterson Oven Co., 9900 Franklin Ave., Franklin Park, Ill.

FURNACES (Gray Iron Melting)

American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Pittsburgh Lectromelt Furnace Corp., P.O. Box 1125, Pittsburgh, Pa.
Reda Pump Co., Bartlesville, Oklahoma

FURNACES (Heat Treating)

Ajax Electric Co., Inc., Philadelphia 23, Pa.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Electric Furnace Co., Salem, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Holcroft & Company, 6545 Epworth Blvd., Detroit 10, Mich.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.

FURNACES, HEAT TREATING (Electric)

Ajax Electric Co., Inc., Philadelphia 23, Pa.
Ajax Electrothermic Corp., Trenton, N. J.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

FURNACES (Induction Heating)

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

FURNACES (Malleable Annealing)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Electric Furnace Co., Salem, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
General Electric Co., Schenectady, N. Y.
Holcroft & Company, 6545 Epworth Blvd., Detroit 10, Mich.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Malleable Melting)

American Bridge Co., Pittsburgh 19, Pa.
Pittsburgh Lectromelt Furnace Corp., P.O. Box 1125, Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Nonferrous Melting)

Ajax Electrothermic Corp., Trenton, N. J.
Ajax Engineering Corp., Trenton, N. J.
Campbell-Hausfeld Co., Harrison, O.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Reda Pump Co., Bartlesville, Oklahoma
Stroman Furnace & Engineering Co., Div. of Peterson Oven Co., 9900 Franklin Ave., Franklin Park, Ill.

FURNACES (Powdered Coal)

Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Steel Melting)

Ajax Electrothermic Corp., Trenton, N. J.
American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Pittsburgh Lectromelt Furnace Corp., P.O. Box 1125, Pittsburgh, Pa.

FURNACE BLOWERS

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Campbell-Hausfeld Co., Harrison, O.
Joy Mfg. Co., La-Del Division, New Philadelphia, Ohio.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Roots-Connersville Blower Corp., Connersville, Ind.

FURNACE LININGS

Campbell-Hausfeld Co., Harrison, O.
Carborundum Co., Perth Amboy, N. J.
Electro Refractories & Alloys Corp., Vars Building, Buffalo 2, N. Y.
Ironton Fire Brick Co., Ironton, O.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
National Carbon Co. Inc., Carbon Products Div., 30 E. 42nd St., New York 17, N. Y.
Stroman Furnace & Engineering Co., Div. of Peterson Oven Co., 9900 Franklin Ave., Franklin Park, Ill.
Titanium Alloy Mfg. Div., National Lead Co., Hyde Park Blvd., Niagara Falls, N. Y.
United States Graphite Co., Saginaw, Mich.

GAGGERS

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Wadsworth Equipment Co., 555 Lafollette St., Akron, Ohio.

GAS (Oxygen, Acetylene, Industrial)

Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.
Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

GAS BURNERS

Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard St., Chicago 12, Ill.

GENERATORS (Acetylene)

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

GLOVES (Industrial, Safety)

American Optical Co., Southbridge, Mass.
United States Rubber Co., 4300 New Haven Ave., Ft. Wayne 4, Ind.

GOGGLES and EYE PROTECTORS

American Optical Co., Southbridge, Mass.
B. F. McDonald Co., 5112 South Hoover St., Los Angeles 37, Calif.
Wilson Products Inc., Reading, Pa.

GRAPHITE

Acheson Colloids Corp., Port Huron, Mich.
Joseph Dixon Crucible Co., Monmouth St., Jersey City, N. J.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
International Graphite & Electrode Corp., St. Marys, Pa.
National Carbon Co. Inc., Carbon Products Div., 30 E. 42nd St., New York 17.
United States Graphite Co., Saginaw, Mich.

GRAPHITIZER

United States Graphite Co., Saginaw, Mich.

GRINDERS (Electric Portable)

Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.
Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio.
Standard Electrical Tool Co., 2488 River Road, Cincinnati 4, Ohio.
U. S. Electrical Tool Co., Cincinnati 4, O.

GRINDERS (Flexible Shaft)

Mall Tool Co., 7720 So. Chicago Ave., Chicago 19, Ill.

GRINDERS (Hand)

Chicago Wheel & Mfg. Co., 1101 W. Monroe, Chicago 7, Ill

GRINDERS (Pneumatic Portable)

Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.
Cleco Pneumatic Tool Div., Reed Roller Bit Co., Houston, Tex.
Master Pneumatic Tool Co., Inc., Orwell, Ohio.
Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio.

GRINDERS (Portable Electric)

Mall Tool Co., 7720 So. Chicago Ave., Chicago 19, Ill.

GRINDERS (Surface, Bench, Disc, Floor)

Bradford Machine Tool Co., 659 Evans St., Cincinnati, Ohio.
Fox Grinders, Inc., Oliver Bldg., Pittsburgh 22, Pa.
Standard Electrical Tool Co., 2488 River Road, Cincinnati 4, Ohio.
U. S. Electrical Tool Co., 2488 River Rd., Cincinnati 4, O.

GRINDERS (Swing Frame)

Fox Grinders, Inc., Oliver Bldg., Pittsburgh 22, Pa.
Sutter Products Co., Dearborn, Mich.

GRINDING WHEELS—See ABRASIVE WHEELS

GRINDING WHEEL DRESSERS

Carborundum Co., Niagara Falls, N. Y.
Desmond-Stephans Mfg. Co., Urbana, O.

GRINDSTONES

Cleveland Quarries Co., 1740 E. 12th St., Cleveland 14, Ohio
Bay State Abrasive Products Co., Westboro, Mass.
Sterling Grinding Wheel Division, Cleveland Quarries Co., Tiffin, Ohio

GRIT (Abrasive)

Alloy Metal Abrasive Co., Ann Arbor, Mich.
American Steel Abrasives Co., Galion, O.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Carborundum Co., Niagara Falls, N. Y.
Clayton Sherman Abrasives Co., 3896 Lonyo Rd., Detroit 10, Mich
Cleveland Metal Abrasive Co., 887 E. 67th St., Cleveland, Ohio
Globe Steel Abrasive Co., Mansfield, Ohio.
Hickman-Williams & Co., Union Commerce Bldg., Cleveland 14, O
Metal Blast, Inc., 871 E. 67th St., Cleveland, Ohio.
Pangborn Corp., Hagerstown, Md
Pittsburgh Crushed Steel Co., Pittsburgh 1, Pa.

HAMMERS (Chipping)

Arrow Tools Inc., 1900 S. Kostner, Chicago, Ill.
Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.

HAMMERS (Chipping) (Cont'd.)

Cleco Pneumatic Tool Div., Reed Roller Bit Co., Houston, Texas.
Dayton Pneumatic Tool Co., Dayton 1, Ohio.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.
Master Pneumatic Tool Co., Inc., Orwell, Ohio.
Schramm Inc., West Chester, Pa.

HARDNESS TESTING EQUIPMENT

Detroit Testing Machine Co., 19390 Grinnell Ave., Detroit 13, Mich.
Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.
Foxboro Company, Foxboro, Mass.
Claude S. Gordon Co., 3000 So. Wallace, Chicago 16, Ill.
Illinois Testing Laboratories, Inc., 418 N. LaSalle St., Chicago 10, Ill.

HEAT CONTROL AND RECORDING DEVICES

Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Marshall Co., L. H., 270 W. Lane, Columbus 1, O.

HEATERS (Gas, Oil, Electric)

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Lanly Co., 750 Prospect Ave., Cleveland 15, Ohio.
J. O. Ross Engineering Corp., 444 Madison Ave., New York 17, N.Y.

HEATERS (High Frequency Electric)

Ajax Electrothermic Corp., Trenton, N. J.

HEATERS (Indirect Fired)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

HEATERS (Space, Unit, Direct Fired)

Dravo Corp., Neville Island, Pittsburgh 25, Pa.
Drying Systems, Inc., 1801 Foster Ave., Chicago 40, Ill.

HEATERS (Space, Unit, Oven, Water)

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

HELMETS (Blasting)

American Wheelabrator & Equipment Co., Mishawaka, Ind.
American Optical Co., Southbridge, Mass.
B. F. McDonald Co., 5112 South Hoover St., Los Angeles 37, Calif.
Pangborn Corp., Hagerstown, Md.
W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.

HELMETS (Welding)

American Optical Co., Southbridge, Mass.

HOISTS (Air)

Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.
Curtis Pneumatic Machinery Div. Curtis Mfg. Co., 1943 Kienlen Ave., St. Louis 20, Mo.
Gardner-Denver Co., Quincy, Ill.
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.

HOISTS (Chain)

Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.

HOISTS (Electric)

Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.
Modern Equipment Co., Port Washington, Wis.
Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

HOISTS (Hand)

Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.

HOISTS (Hydraulic)

Miller Motor Co., 4027 N. Kedzie, Chicago 18, Ill.

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WHEELS, ABRASIVE (Cut-off)

Bay State Abrasive Products Co., Westboro, Mass.

Carborundum Co., Perth Amboy, N. J.

Electro Refractories & Alloys Corp., Vars Bldg., Buffalo 2, N. Y.

Norton Company, Worcester 6, Mass.

Raybestos-Manhattan, Inc., Manhattan Rubber Division, Passaic, N. J.

Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, Pa.

Sterling Grinding Wheel Division, Cleveland Quarries Co., Tiffin, Ohio

WHEELS (Wire Brush)

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, Ohio.

WIRE BENDERS

Redford Iron & Equipment Co., 20733 Glendale Ave., Detroit 23, Mich.

WIRE BRUSHES

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, Ohio.

WIRE CUTTERS

Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio

Redford Iron & Equipment Co., 20733 Glendale Ave., Detroit 23, Mich.

WIRE NAILS

Republic Steel Corp., 3100 E. 45th St., Cleveland 4, Ohio.

WOODWORKING MACHINERY

Oliver Machinery Co., Grand Rapids 2, Mich.

X-RAY EQUIPMENT

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

General Electric X-Ray Corp., 4855 Electric Ave., Milwaukee 14, Wis.

X-RAY FILMS

Eastman Kodak Co., Rochester, N. Y.

General Electric X-Ray Corp., 4855 Electric Ave., Milwaukee 14, Wis.

ZINC

Federated Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5, N. Y.

—When writing advertisers, please mention FOUNDRY—

CLASSIFIED ADVERTISING

Help Wanted

STEEL FOUNDRY MAN

Opportunities for the following men in a large steel foundry: Experienced staff or unit foremen for: Melted Metals Dept; Foundry; Core Room; C. F. & A.; Mechanical Trades.

Government owned defense plant in Chicago area to be operated on armor steel castings. Company operating setup sufficiently large and aggressive to afford permanent opportunity to men whose performance proves to be outstanding.

BOX 429
FOUNDRY CLEVELAND 13, OHIO

CUPOLA OPERATOR
CLEANING ROOM FOREMAN

An old, well established, triple A rated manufacturing concern, located in North Central Ohio and with a mechanized grey iron foundry invites correspondence with qualified men for the following positions.

CUPOLA OPERATOR
CLEANING ROOM FOREMAN

Kindly state age, experience and give references. Correspondence will be held in strict confidence.

BOX 427
FOUNDRY CLEVELAND 13, OHIO

STEEL FOUNDRY SAND SUPERVISOR

Man with the necessary background in education and experience to enable him to assume complete supervision over sand laboratory, sand mills, sand systems and conduct a research program on sand making recommendations for any necessary changes, etc. Address: Box 417, FOUNDRY, Cleveland 13, Ohio.

PATTERN SHOP FOREMAN

Young experienced supervisor with working knowledge of repair and maintenance of metal patterns. Semi-captive grey iron foundry near Detroit. Send recent photo with complete details.

BOX 433
FOUNDRY CLEVELAND 13, OHIO

MECHANICAL ENGINEER

Virginia foundry has opening for young 28-35 graduate Mechanical Engineer to act as assistant to President. Must be energetic, aggressive and willing to work long, hard hours. Prefer man with experience. Excellent opportunity for right man. Address: Box 421, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERVISOR

For a gray iron foundry in Eastern Pennsylvania melting 50 tons a day. Setup jobs; molding rates; estimate costs; read blue prints. Well-experienced in cupola practice, molding, core-making, sand control and patterns. Address: Box 435, FOUNDRY, Cleveland 13, Ohio.

GENERAL FOUNDRY FOREMAN

Malleable foundry in Ohio. Must have experience in all phases of foundry operation. Ability to estimate from blueprints and set molding prices required. Give age, experience, education and salary. Address: Box 414, FOUNDRY, Cleveland 13, Ohio.

GENERAL FOUNDRY MANAGER

Qualifications, 35 to 50 years of age, experienced in gray iron production of squeezer work, medium size rollover work and slinger work, in mechanized shop employing 125 to 1500 men. Located in middle west. Do not apply if you cannot fulfill these requirements. Address: Box 416, FOUNDRY, Cleveland 13, Ohio.

Help Wanted

MOLDING MACHINE FOREMAN

Northeastern Ohio gray iron foundry requires an experienced Rockover molding machine foreman.

BOX 411
FOUNDRY CLEVELAND 13, OHIO

FOUNDRY SUPERVISOR

For a gray iron foundry in Western Pennsylvania melting 10 to 15 tons per day. Thorough experience in cupola operation, molding and core room practice, sand control and chilled castings. We operate our own pattern shop. Please give personal experience, history, availability and salary expected. Address: Box 233, FOUNDRY, Cleveland 13, Ohio.

TIME STUDY AND INCENTIVES MAN

Preferably with jobbing foundry experience. In reply state education, experience and salary expected. Address: Box 425, FOUNDRY, Cleveland 13, Ohio.

PATTERN MAKERS

Good future for experienced pattern makers in largest steel foundry in intermountain West. State qualifications, age and availability. Address: Box 413, FOUNDRY, Cleveland 13, Ohio.

FOREMAN

Lifetime opportunity for foundry foreman and assistant to superintendent. Capable taking full charge of mechanized soil pipe plant in metropolitan New York. Steady position. Address: Box 415, FOUNDRY, Cleveland 13, Ohio.

A-1 WORKS MANAGER

For brass foundry in Northern Ohio plant. Must also be active foundry superintendent with proven quality and production record. Include references and record. Address: Box 434, FOUNDRY, Cleveland 13, Ohio.

SALES ENGINEER—FOUNDRY EQUIPMENT

Leading manufacturer of foundry equipment has unusual opportunity for an experienced man in a mid-west territory. Include details of your experience, education, age, in your first letter. All replies confidential.

BOX 441
FOUNDRY CLEVELAND 13, OHIO

EXPERIENCED FOUNDRYMAN

Midwestern gray iron foundry desires experienced man capable of supervising production and assembly of small to medium sized cores. Must be able to teach and coordinate making of cores on benches and coreblowers. In replying please state age, experience and salary expected. Address: Box 302, FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

TECHNICAL FOUNDRY SUPERINTENDENT

Practical, progressive experience of 20 years as journeyman and executive supervision in grey iron and nonferrous sand castings. Job and production rigging of automotive and medium heavy machinery types in green, dry and loam sands. Engineering education, outstanding labor relations, high productivity and low scrap ratio records. Experience includes sales engineering and extensive knowledge of machine shop operations. Age 44, desires permanent connection in the eastern states. Address: Box 430, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY MANAGER OR SUPERINTENDENT

Practical, progressive, 30 years' experience gray iron, semi-steel and malleable foundries. Capable of taking complete charge of all phases of any foundry—cost, sales, estimating from prints, rigging for high production, reduce scrap. Past 15 years in executive capacity. Good references, available at once. Address: Box 401, FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

SUPERINTENDENT

Steel foundry superintendent or assistant foundry manager. Experienced and can supervise electric and open hearth furnace melting; all types of green and dry sand molding; sand control and reclamation; casting cleaning and repair welding; heat treatment; foundry raw materials purchasing. Address: Box 420, FOUNDRY, Cleveland 13, Ohio.

PLANT MANAGER OR FOUNDRY SUPERINTENDENT

Gray iron, twenty-eight years' experience, production or jobbing, mechanized or otherwise. Seventeen years in executive capacity and a background of specialized training in factory management. Age 46, excellent references and recommendations. Address: Box 357, FOUNDRY, Cleveland 13, Ohio.

MANAGER—ASSISTANT TO PRESIDENT

Steel, iron, brass. Thoroughly experienced in every shop operation, metallurgy, engineering, accounting and management. Excellent ability to develop a superior organization by leading, teaching and example. Outstanding reputation for keen analysis, sound judgement and a rare combination of practical experience, managerial ability and effective personality. Address: Box 375, FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT

Practical, progressive, experience of 28 years in small, medium and large castings in cast iron and nonferrous metals. Take charge of all phases of work in foundry. Employed. Good references. East preferred but will consider any good position. Address: Box 412, FOUNDRY, Cleveland 13, Ohio.

GENERAL MANAGER OR SUPERINTENDENT

Twenty years' experience in all phases of foundry operations and supervision. Desires permanent position with a progressive company, producing quality grey iron, semi-steel or steel castings, jobbing or production. Available on reasonable notice. At present employed. Address: Box 419, FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT OR ASSISTANT SUPERINTENDENT

Practical, with a technical education. 45 years old. Sixteen years as foreman and superintendent. Experienced in production of jobbing and machine tool castings. Well versed in cupola practice, cast iron analysis. Prefer East or South East. Address: Box 339, FOUNDRY, Cleveland 13, Ohio.

INDUSTRIAL ENGINEER

Graduate; 14-years' experience in methods, plant and product engineering, incentive work standards production schedules and cost development and analysis. Malleable and gray iron foundries. Location not a primary factor. Address: Box 431, FOUNDRY, Cleveland 13, Ohio.

GENERAL FOREMAN OR FOREMAN

Twenty-five years' practical foundry experience. Malleable or gray iron. Knowledge of scrap causes and elimination. Prefer Illinois or Wisconsin. Address: Box 432, FOUNDRY, Cleveland 13, Ohio.

WEIGHT ESTIMATING

Estimating of casting weights furnished by return mail. Accurate, reliable and confidential service. Nominal fee. Send blueprints: Address: CHARLES E. ROLAND, 215 FOREST DRIVE, ITASCA, ILL.

FOUNDRY ENGINEER

24 years' experience in nonferrous field. Permanent mold and sand. Thoroughly familiar with all phases of foundry. Can handle job from sales contact to delivery of castings. Available at once. Address: Box 361, FOUNDRY, Cleveland 13, Ohio.

CLASSIFIED ADVERTISING

Positions Wanted

INDUSTRIAL ENGINEER
OR
TECHNICAL FOUNDRY SUPERINTENDENT

Steel, grey iron, malleable or aluminum. Experienced in all shop operations, excellent ability to develop a good organization. Will reduce all cost and increase production. Address: Box 440, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY MANAGER
OR
SUPERINTENDENT

Now employed desires change for logical reasons. Experience includes 28 years' producing high quality iron steel and stainless castings. Technical graduate with practical background. Excellent labor relations. Address: Box 442, FOUNDRY, Cleveland 13, Ohio.

STEEL CLEANING SUPERVISOR

15 years' experience in the most modern methods of cleaning steel casting. Also welding and burning. Best of references. Age 33. Address: Box 428, FOUNDRY, Cleveland 13, Ohio.

GENERAL FOREMAN OR SUPERINTENDENT

23 years' practical and technical experience, modern and coremaker. Aluminum, malleable preferred. Metallurgy sand control, production jobbing. Age 41, married. A-1 references. Address: Box 436, FOUNDRY, Cleveland 13, Ohio.

Engineering Service

FOUNDRY ADVISORY ENGINEER

Practical foundryman for consultations, your plant or mine. Have designed permanent molds since 1930 for ferrous and nonferrous castings such as washtubs, hollow ware, cylinders, shells.

WAGNER PERMANENT MOLD CO.
2910 EMPIRE AVE. BURBANK, CALIFORNIA

Consulting Service

CASTING CONSULTANT

FOUNDRY ENGINEER OF 15 YEARS' EXPERIENCE WILL DESIGN YOUR PRODUCTS FOR EFFICIENT FOUNDRY PRODUCTION. WILL PLACE YOUR CASTING REQUIREMENTS IF DESIRED. EXCELLENT DELIVERY GUARANTEED ON PATTERNS AND PERMANENT MOULDS. SEND PRINTS OR INQUIRIES AT NO OBLIGATION FOR PROMPT REPLY. ADDRESS: BOX 390, FOUNDRY, CLEVELAND 13, OHIO.

Available Capacity

AVAILABLE CAPACITY

Our foundry has open capacity to supply small and medium size gray iron castings. Send sample. Address: OREGON CASTINGS CO RD 3 Lititz, Pa

OPEN CAPACITY

CASTING CAPACITIES. WE HAVE SOME OPEN CAPACITY FOR ALUMINUM PERMANENT MOULD CASTINGS. WE SPECIALIZE IN CASTINGS CONTAINING INSERTS. ADDRESS: BOX 391, FOUNDRY, CLEVELAND 13, OHIO.

OPEN CAPACITY

Production runs, small to medium size grey iron castings. Send samples to: BUCK IRON COMPANY, ROUTE #1, QUARRYVILLE, PA.

OPEN CAPACITY

PATTERN AND MOULD SERVICES. WE HAVE SAME OPEN CAPACITY FOR MATCH PLATE, COPE AND DRAG PATTERNS AND PERMANENT MOULDS. CAN GUARANTEE EXCELLENT DELIVERY. ADDRESS: BOX 389, FOUNDRY, CLEVELAND 13, OHIO.

Wanted-To-Buy

FOUNDRY
MACHINE SHOP
WANTED
IN MIDDLE EASTERN U. S.

By responsible large corporation. Heavy medium floor jobbing foundry with heavy medium machine shop capacity. Approximately 15 tons daily. Direct solicitations from owners preferred. Strictly confidential.

BOX FF603
221 W. 41st ST. NEW YORK 18, N. Y.

WANTED

Two Whiting #9 cupolas. Give serial number, height of stack, height and size of charging door, date of installation and approximate usage. Give diameter inside lining.

WM. P. LAYTHAM & SONS CO., INC.
MARKET & 34th STREETS
PATERSON, NEW JERSEY

WANTED

One #5 cupola in good condition. Address: CENTRIFUGAL FOUNDRY CO., MUSKEGON, MICHIGAN.

WANTED

13" x 22" steel flasks,
4" drag, 6" to 8" cope.
13" x 30" steel flasks,
6" to 8" cope, 4" drag.

OHIO FOUNDRY CO.
9812 QUINCY AVENUE CLEVELAND, OHIO

WANTED

Foundry and Sand blast parts or equipment.
Address: DIAMOND SALES, INC.
5654 WEST JEFF., DETROIT 9, MICH.

BOOK WANTED

Wish to buy one copy of "IMPACT CLEANING" by Rosenberger. Original price $7.00. If you have a copy you can spare, please reply: Box 422, FOUNDRY, Cleveland 13, Ohio.

WANTED

Patterns for horse head hitching posts, colored or Jockey Boy hitching stands and other cast iron novelties. Address: Box 423, FOUNDRY, Cleveland 13, Ohio.

WANTED

For export discontinued foundry production patterns for useful items. Must be reasonable. Address: Box 424, FOUNDRY, Cleveland 13, Ohio.

WANTED
BLOWER

Positive type, Roots Connersville, capacity C.F.A.M. 12,000 and over. No. 7½ or 8. Address: SANITARY CO. OF AMERICA, LINFIELD, PA.

WANTED

Electric furnace 350 to 5000 lbs. For cast iron and steel. Give voltage, equipment, condition and price. ADDRESS: EMPIRE PATTERN & FOUNDRY CO., BOX 1647, TULSA, OKLAHOMA.

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size condition and lowest cash price or immediate acceptance. Address Box 578, FOUNDRY, Cleveland 13, Ohio.

Employment Service

SALARIED PERSONNEL

$3,000-$25,000. This reliable service, established 1927, conducts confidential negotiations for high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Address: JIRA THAYER JENNINGS 241 ORANGE STREET, NEW HAVEN 10 CONN.

Employment Service

SALARIED POSITIONS

$3,500 to $35,000. We offer the original personal employment service (established 41 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. Address: R. W. BIXBY, INC., 101 DUN BUILDING, BUFFALO 2, NEW YORK.

Foundries For Sale

GRAY-IRON FOUNDRY

Brick and steel foundry with two clear spaces 80 x 320 ft. with overhead monorail, story height 13 ft. 6 in., gable 23 ft., attached building 40 x 50 ft., story heights 15 ft. 6 in. and 13 ft. 4 in., has two No. 7 Whiting cupolas 72 in. in diameter. Contains equipment, ideal for mechanized operation, plenty dumping ground, built 1917, composition roof, vicinity population about 9000, near center of U. S. population, expect natural gas this year, served by two major railroads, water transportation available, city hydrant fire protection, land for expansion. Subject to withdrawal without notice. Address: Box 358, FOUNDRY, Cleveland 13, Ohio.

SMALL FOUNDRY FOR SALE

On New York Central Railroad side track in Lockport, New York. Floor space of molders approximately 11,000 square feet with exceptional dumping ground for disposal of slag and waste indefinitely at lowest expense over declivity on the land. Considerable foundry equipment thrown in for the price of assessed value of the real estate. Address: JEFFERSON UNION COMPANY, LOCKPORT, NEW YORK.

FOR SALE

FOUNDRY AND MACHINE SHOP IN MINOT, N. DAKOTA

Foundry building 50' x 75' with charging room 16' x 20', located at end cleaning room 20' x 30' at side. Fully equipped to make castings up to one ton.
Machine and welding shop 30' x 40' with large lathe, drill presses, grinders and welding equipment.
Wood working and storage building 30' x 40'.
Office building 12' x 18'.
Situated on four large lots.
Priced to sell $40000.00.

MINOT FOUNDRY CO.
P. O. BOX 1442
MINOT, NO. DAKOTA

FOUNDRY FOR SALE

Most profitable medium size jobbing foundry in this section of the country. Well equipped, situated between Cleveland and Detroit. Arranged for production. Deal involves $250,000.00. Owners must retire. Opportunity for user of castings with certificate of necessity. Address: Box 340, FOUNDRY, Cleveland 13, Ohio.

GRAY IRON FOUNDRY

In continuous operation since 1897. Includes 1½ acres of land, foundry billing sheds and office building. Fully equipped and supplied. Presently operating three squeezers plus floor work. 27" cupola. Located in Central California. Price $25,000. Address: Box 418, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY—PROPERTY—WESTERN PA.

Fully equipped small foundry including seven crucible molding machines, grinding machine shop; city 2800; seven room home; acre lot; price low. Address: APPLE COMPANY, BROKERS, CLEVELAND, OHIO.

CLASSIFIED ADVERTISING

Foundries For Sale

STEEL AND BRICK CONSTRUCTED BUILDING
24,000 Square Feet
Approximately Eight Acres of Land
Railroad Siding

Suitable For

GRAY IRON AND NON-FERROUS FOUNDRY

Available Immediately

LOCATED AT MINERAL RIDGE, OHIO
RIDGE CASTING DIVISION
HELLIER COAL & COKE COMPANY
1003 Union National Bank Bldg.
Youngstown, Ohio
Phone: Youngstown 4-5394

FOR SALE

Nonferrous foundry in large industrial town near Chicago. Capacity 2 ton aluminum and 2 ton brass per day. Have some government work. Price $50,000. Address: Box 395, FOUNDRY, Cleveland 13, Ohio.

FOR LEASE OR SALE

Well equipped brass and aluminum foundry. Plenty of work also finished product. Old age and bad health reason for selling. Address: C. J. Doerr, 725 N. Delphos at Kokomo, Indiana.

For Sale

FOR SALE

1 American Sand Cutter, Type AA Size 6'-0" NW with 15 HP Motor, Volts 440, 3 Phase.

1—Style 900 GT Hausfeld Gear Tilting Cast Iron Pot for aluminum, blower driven by electric motor for use with natural gas. Brand new, has never been used.

We have the following flask equipment we will sell only as a lot, no single pieces: Hines aluminum heavy-duty pop-off type flasks, truss rods on side pieces, single pins, ¾" round. No jackets.

No.	Size	Cope	Drag	Pin Centers	Condition
1	24x48	12	12	50½	Excellent, slightly used
1	34x47	12	12	51½	New
1	36x36	12	12	40	New
1	42x42	12	12	46	New
2	12x24	6	6		Excellent
1	12x24	9			Excellent
2	12x24		9		Excellent
1	16x16	6			Excellent
1	16x16		5		Excellent
1	16x24		9		Excellent
1	16x28		9		Excellent
1	18x24	6	6		Excellent
2	18x24	9			Excellent
2	20x20	9	9		Excellent
1	20x20	12	12		Excellent

MEMPHIS CASTING WORKS INC.
1006 OAKLAND AVE. MEMPHIS 1, TENN.

FOR SALE
SAND BLAST EQUIPMENT

Pangborn 21GK2 Rotoblast bbl. over $600 in spare parts—$3500.
Pangborn Rotoblast cabinet, type ES-213. Used for cleaning propeller blades. Price 30% of list.
Pangborn 1 GF-Tum-bbl. Good condition. Price $400.00.
Pangborn direct pressure tank, model AQI, like new $575.00.
Wheelabrator 6' air table $1500.00.
Baird tumbling barrel, approximately 2 cubic feet. Complete $250.00.
Sand Blast Cabinets, generators, dust collectors and blowers. All kinds and sizes. Like new. 60% less list price.
Crane—2-ton, twin hook—21' span.....$400.00.
Fork lift truck—1-ton $900.00.

DIAMOND SALES INC.
5654 W. JEFF. AVE.
DETROIT 9, MICHIGAN

FOR SALE

9' Pangborn Table Blast—Latest Type Still in operation
Jolt Squeeze Stripping Machines—Osborn, International, and Johnston & Jennings—12" cylinders

BALCHER MACHINERY COMPANY
1884 S. COMPTON ROAD
CLEVELAND HEIGHTS 18, OHIO
TELEPHONE: FAIRMOUNT 1-1186

For Sale

FOR SALE

1—3000 lb. Worm Gear Ladle V-Type Bale.
6—"G" Rollover Machines 20 x 8.
1—SPO Jolt Strip Squeeze Molding Machine.
2—Osborn J-75 Jolt Squeezers 10".
4—Tabor Jolt Squeezers 10".
1—Model "S" Beardsley & Piper Screenarator.
1—Jeffrey Sand Conditioner.
1—Sprue Cutter with 2 HP. Motor.
1—North American Blower with 15 HP. Motor 2100 C.F.M., 16 oz pressure.
1—North American Blower with 5 H.P. Motor, 320 C.F.M., 32 oz. pressure.
6—10" New—Haynes Jolt Squeezers.
6—12" New—Haynes Jolt Squeezers.
1—Chicago Pneumatic Air Hoist.
1—Osborn Molding Machine Model 342.
1—International Molding Machine HJ 16 x 6.
1—Arcade Jolt Strip Squeezer.
1—International Rollover Type R.
1—Ladle Cart with 5 Ladle Pots, 350 lbs. capacity.
1—Chisholm & Moore Electric Hoist, 2 Ton Capacity.
1—Band Saw
1—#400 Stroman Tilting Type Furnace, practically new, Complete with motor, blower, and burner, and new Crucible.
1—Hausefeld Tilting Type Furnace 250 to 300 lb. capacity, practically new.
1—#36 Osborn Core Draw Machine.
1—Lyon-Raymond Hyd. Lift Truck 2500 lb. capacity.

HAYNES FOUNDRY EQUIPMENT CO.
814 ADA STREET KALAMAZOO 52, MICH.

FOR SALE

12—#275 JW Portable or Stationary Jolt Squeeze Molding Machines.
30—Tabor Yoke Bar Plain Squeeze Molding Machines, Stationary.
4—#2047 Osborn Jolt Rollover Molding Machines.
4—Nicholls Jolt Squeeze 11F.
10—1 Ton Open Top Worm Geared Ladles.
10—Walker-York & Monarch Coke Fired Stationary & Tilting Furnaces.
4—#610-13 Osborn Jolt Rollover Molding Machines.
1—Mummert Dixon 22" Swing Frame Grinder.
All types of Cupola Blowers, Positive Pressure, & Centrifugal.
Thousands of feet of various sizes of Roller Conveyors.
Send us your Inquiries. Large Stocks.

UNIVERSAL MACHINERY & EQUIPMENT COMPANY,
320 E. BROAD STREET,
SHILLINGTON READING, PENNA.
R. B. HARRISON,
MANAGER FOUNDRY DEPARTMENT
PHONES READING 30311—40146

FOR SALE

One type FS #553, Ingersoll-Rand cupola blower, 8100 C.F.M., 24 ounces pressure, 75 horse power, 3600 R.P.M. direct connected, 220/440/550 volt, 60 cycle, motor, complete with Foxboro air weight. Controller atmospheric compensator type, practically new. May be inspected at our plant and is now ready for shipment. Address: ATLAS FOUNDRY COMPANY, MARION, INDIANA.

SOIL PIPE AND FITTING EQUIPMENT

Assorted patterns, arbors, pipe machine, special ladles and other equipment necessary for the manufacture of soil pipe and fittings. Address: J. F. QUEST FOUNDRY CO., 900 SOUTH 4th ST., MINNEAPOLIS 15, MINN.

For Sale

FOR SALE

2—Osborn #332-38 Jolt Squeeze Rollover Draw
3—Osborn #601 Jolt Rollover Pattern Draw Machines
2—Osborn #602 Jolt Rollover Pattern Draw Machines
2—Osborn #712 Jolt Squeeze Pin Lift Machines Never Used.
1—Davenport #165 Jolt Squeeze Pin Lift Machines
2—Tabor Portable Jolt Rollover Pattern Draw Machines 30 x 40 Tables
2—International Jolt Rollover Pattern Draw Molding Machines—Portable Type
2—International Type F, 27 x 16 Heavy Duty Jolt Rollover Pattern Draw Molding Machines in service 18 months.
6—Hand Rollover Core Machines, 20 x 8, 22 x 12, 18 x 8.
1—Demmler #2 Coreblower, Excellent Condition, Used 18 months.
All equipment immediately available.

BOX 439
FOUNDRY CLEVELAND 13, OHIO

FOR SALE

TUMBLAST CABINET, Pangborn model 1172A, ser. #7412911, Gravity Feed or Air Blast, 30" x 40" Barrel Model 2 GD1, 2.7 rpm. Uses sand or shot. Good Condition. All motors A.C. $1250.00 fob
SWING GRINDER, Mummert & Dixon 24 x 4. Excellent cond. $450.00 fob.
Tabor, Portable Shockless Jarring Roll Over & Pattern Drawing Machine—24" x 16". $350.00 fob.
MAGNETIC SEPARATOR, Dings Magnetic Separator. Can be used with Dust Collector. Size: 12" x 18"—110 v.— s. ph. motor 2 hp. Ser. R5771. $600.00 fob.
BLAST PEENING CABINET, Pangborn. 4 spindle automatic table equipped with BVR-7 Pangborn abrasive separator & bucket-belt elevator. 20 hp, 5 hp and 2 hp motors included. $2000.00 fob.
SAND BLASTING TANK, Pangborn. Model 1AV11. $150.00 fob.
AIR COMPRESSOR, Worthington 9½ x 12, 40 hp AC motor & starter.
AIR COMPRESSOR, Sullivan 11 x 10, 40 hp AC motor & starter.
ELECTRIC PLATFORM TRUCK, Yale 6000#, with battery. $1250.00 fob.
Turbine Blowers, Spencer—all sizes.
Conveyor—all sizes and types.
Motors, speed reducers, blowers—any size.
Cranes—overhead & jib, all sizes.
Hoists—electric, hand, air—1 to 10 ton.
Air Compressors—from 1 hp up.
Foundry Equipment. Send us your inquiries.

ALLIED MATERIALS HANDLING CO.
4657 SPRING GROVE CIN'TI 32, O.

FOR SALE
DETROIT ELECTRIC FURNACE

Model AA 1200 lb. capacity for cold melting, 2600 lb. capacity for duplexing. Complete with electrical breakers, buss bars, switch panels, transformers, compensators. Used approximately 9 months. This equipment is offered for sale as we have discontinued the type of work for which this furnace was purchased. Approximately $1200 worth of new linings and repair parts go with this furnace. Price $14,500.

NOBLESVILLE CASTING COMPANY, INC.
NOBLESVILLE, INDIANA

TUMBLING BARRELS

1—Whiting 4-ft. diam. 6-ft. long
1—Whiting 30" x 9-ft. long
(Complete with countershafts)

FAIRBANKS, MORSE & CO.
ST. JOHNSBURY, VERMONT

FOR SALE

Fisher, 4 burner, oil, 1000# cap. MNP furnace American Sand cutter Model MS970-70" swath Address: Box 426, FOUNDRY, Cleveland 13 Ohio.

For Sale

FOR SALE

MOLDING MACHINES
1—International Type GR Stationary 24 x 10
1—International Type RJ Stationary 14 x 8
1—International Type G Stationary 24 x 10
1—International Type R Portable 24 x 10
1—International Type F Stationary 26 x 8
2—Tabor Stationary Jolt Squeeze
1—International Type M Portable 24 x 10
1—Osborn 74W Plain Squeeze Portable
2—Osborn 75W Plain Squeeze Portable
4—Arcade 72-28 Jolt Squeeze Stationary
2—SPO #305 Jolt Strippers
2—SPO #611B Stationary Oscillating Jolt Squeeze Strippers
1—SPO #4½ JHS Jolt Hand Strip
BLOWERS FOR CUPOLAS AND FURNACES
2—15 HP Spencer Turbine 2250 CFM @ 16-oz.
1—Connersville rotary 24 cu. ft. per rev. 6200 C.F.M.
Maxon-Premix Blowers for Gas ¼ to 1 HP
METAL MELTING EQUIPMENT
1—Hausfeld 2000# aluminum capacity furnace, barrel type, open flame, oil fired
New 32" to 41" dia. shell cupolas made to order.
TUMBLING MILLS AND SAND BLAST
1—Pangborn style GJ-1 rotoblast barrel complete with Pangborn style FM automatic loader. Load capacity approx. 16 cu. ft.
1—Pangborn No. 2 GH direct pressure type sand blast barrel, motor driven, Complete unit.
1—Pangborn Sand Blast Unit, including generator tank, shot cleaner, bucket elevator. Suitable for use with room
MISCELLANEOUS
1—American Sand Cutter 72"
2—#16 Roto-clone units complete
1—Continuous Heat Treat Furnace 57' long. 1200° F. max.
2—Sly Economy #12 Cloth Screen Dust Collectors
25 Tons steel flasks in sizes from 26 x 26 to 60 x 60.
4—Heavy Duty Flexible Shaft Grinders 2 HP
Complete stock of rebuilt mill and dust exhaust blowers

CLIFTON MACHINERY COMPANY
1023 W. SIXTH ST. CINCINNATI 3, OHIO

CLEANING EQUIPMENT

1—American #3 Wheelabrator Tablast with four 48" Auxiliary Tables in excellent condition with dust arrestor.
1—American 27 x 36 American Wheelabrator Tumblast Ready to Operate. Used two years.
1—Sly Centrifugal Table Blast Machine 8 Ft. Table An Excellent Buy—No Compressed Air Required.
1—American 36 x 42 Tumblast in good condition.
All equipment available for immediate delivery.

BOX 438
FOUNDRY CLEVELAND 13, OHIO

FOR SALE
MOLDING MACHINES

4—International 20" x 8", Type G
1—Osborne Jolt R.O. #242
1—Jeffrey Sand Conditioner, Portable
1—#9 Whiting Cupola with Blower
2—Chicago Pneumatic 1½ ton Air Hoists

RAY P. SCULLY
SCULLY MACHINERY & EQUIPMENT CO. NOT INC.
767 MILWAUKEE AVE. CHICAGO 22, ILL.
PHONE: CANAL 6-0314

FOR SALE

40 Stevens Cherry Snap Flasks 5 Deg. Taper New and slightly used @ $20.00 each. Send for list of sizes.
900—1" Wood bottom boards used @ 30c each.
6 Electro Mechano Drill Presses cost new $150.00 for $50.00 each.
6 Cleveland and 10 Peterson Vibrators—send for list.
104 Aluminum Pressure Match Plates for making toys. Send for list and prices.

STANLEY MFG. COMPANY
OCONTO, WISCONSIN

FOR SALE

2—Osborn Jolt, Squeeze, Rollover, Draw Molding Machine
1—Besly 53" Surface Disc Grinder
Complete Steel Converter Production Equipment.

GUNITE FOUNDRIES CORPORATION
ROCKFORD, ILLINOIS

CLEANING EQUIPMENT

1—36 x 42 American Wheelabrator Tumblast Available immediately Excellent Condition Apply Narragansett Grey Iron Foundry, Inc. 130 West River St., Providence, R. I.

For Sale

HEAVY DUTY MOLDING MACHINES

1—Osborn #405-77 Jolt Rollover Pattern Draw with Oil Leveling Runout Car—Used 18 months.
1—Davenport Heavy Duty Model #48-SA Jolt Rollover Pattern Draw Machine—Used 4 months.
2—Osborn #403 Heavy Duty Jolt Rollover Pattern Draw Machines—Two years of service, excellent Condition, Low Price.
2—Osborn #560 Jolt Strippers—Like New.
1—Herman Jolt Rollover Pattern Draw Machine. Used 6 months, perfect condition, can be seen in operation, 1500 lbs. capacity.
All above machines for immediate delivery.

BOX 437
FOUNDRY CLEVELAND 13, OHIO

SAND BLASTING EQUIPMENT FOR SALE

Pangborn 6' rotary turn table, suction cabinet type "LE"—price $850.00.
Pangborn 6' table, direct pressure, 4 stationary nozzles, 2AQ4 generators, abrasive separator, reclaimer, dust collectors used for shot peening, blast cleaning gun hammers, stockers, pins, aircraft engine rocket arms—Price $1000.
Pangborn suction cabinet type "NE2" 3 x 5—price $225.
Pangborn suction cabinet 3 x 4—price $200.
Pangborn 2AQ1 generator, abrasive separator, reclaimer with 2 HP electric motor used for sand blasting room—Price $475.00.
Steel grit #80—$90.00 a ton.
Dust collectors 700—285 cfm.
Wheelabrator, rotoblast parts, sand blasting parts in stock.

M. ELSTEIN
141 MANGIN STREET NEW YORK 2, N. Y.

FOR SALE
MOLDING MACHINE

1—International R E S—jolt, squeeze, rollover draw—14" cylinder—6" draw.
1—International P K L—jolt squeeze air pin lift —14" cylinder—5½ lift.
Never used.

BOX 353
FOUNDRY CLEVELAND 13, OHIO

FOUNDRY EQUIPMENT

10 Used Osborn Jolt Rollover Machines Serial Numbers 8112 MM, 10115 E, 10080 H, 10080 L, 10115, 10260 S, 10260 C, 10216 D, 10260 R and 10216 C.
2 Used Osborn Molding Machines No. 2033, Serial Numbers 10291 J & K, with air cylinders and valve control.
2 Used Johnston & Jennings Jolt Squeeze Molding Machines, Serial Numbers 2724 and 2725.
1 Used Johnston & Jennings Portable Jolt Rollover Pattern Draw Molding Machine No. 610B, Serial No. 1341-2933.
Also various other items of Foundry Equipment.

WOLF COMPANY
CHAMBERSBURG, PA.

FOR SALE

One Tabor abrasive cut off machine, model C-10 AF, 220-440 motor, 3 phase, 60 cycles. Used three weeks. Immediate delivery. 50 Hines and general pop-off flask and jackets, some never used and some used, various sizes. Address: INTERSTATE SUPPLY & EQUIPMENT CO., 647 W. VIRGINIA ST., MILWAUKEE 4, WIS.

STACKING MACHINES FOR SALE

Practically new, used about 2 months. 2 International stacking machines. Type JSK-7, jolt, squeeze, pin strip molding machines. Also, approximately 1200—13 x 26 aluminum stack flasks and 160—15 x 29 aluminum bottom boards. Address: BROOKS FURNACE CO., ALBION, MICH.

FOR SALE

Model "M" 89/70 American Wheelabrator sand cutter. Excellent condition—less than two years old. Price $5800.00. Available immediately. Contact: MIDWEST FOUNDRY COMPANY, DIVISION of L. A. DARLING COMPANY, COLDWATER, MICHIGAN. PHONE 1100.

NEVER USED AIR TOOLS

Chicago Pneumatic, Ingersoll-Rand, Thor, Cleco —far below list prices. Send for inventory and price list. ADDRESS: HAYNES EQUIPMENT CO., INC., 144 FULTON ST., NEW MILFORD, N. J. PHONE ORADELL 8-2683.

FOR SALE

Tabor-squeeze stripping molding machine. Kindly state age, condition and price. Hines aluminum pop-off flasks in the following sizes:
12 x 20
12 x 23
14 x 16

NATIONAL FOUNDRY CO. OF NEW YORK, INC.
10 SANDFORD STREET
BROOKLYN 5, NEW YORK

For Sale

USED EQUIPMENT FOR SALE

1—Gisholts tool grinder
1—40" Putman gap lathe
1—14" Rahn carpenter engine lathe

ROLLE MANUFACTURING CO.
LANSDALE PENNSYLVANIA

FOUNDRY VIBRATING SCREEN

Stephens Adamson lathe model MD—very nice condition. V-belt driven by 5 HP motor; New $1400.00—Sell $695.00.

WM. R. SHIELDS CO.
G.M. BUILDING DETROIT 2, MICHIGAN

FOR SALE

Brown potentiometers—model 113661-x-19, 230 V, 60 cy, Range 550°-2000°F. Model 113661-x-53, 115 V, 60 cy, Range 0°-1200°F. $280 ea.

GEORGE KOCH SONS, INC.
10 SO. 11th AVE. EVANSVILLE, IND.

FOR SALE

Two Whiting #7 cupolas. Serial 5072/5073, installed 1939, excellent condition.

WM. P. LAYTHAM & SONS CO., INC.
PATERSON, NEW JERSEY

FOR SALE

One (1) Gardner disc grinder 54" No. 24 horizontal with motor and grinding wheel.

STILLMAN FOUNDRY COMPANY
1927 WILL AVENUE N. W.
GRAND RAPIDS 4, MICHIGAN

WHEELABRATOR

No. 1 American Wheelabrator
45" Dia. Rotary Table
Motor Driven, Dust Collector Unit

DALEY & SIBLEY
99 WOOD ST. WEST HAVEN, CONN.

FOR SALE

BLOUNT PATTERN MAKER'S WOOD LATHE 16" swing, 6-ft. bed, 2 H.P., 550 volt, 60 cycle, 3 phase motor in headstock with controller for 8 speeds; magnetic starter, tripod and standard equipment. In new condition. Only $1250.00 net cash, fob our plant. This lathe is available due to the discontinuance of our pattern making department.

GILBERT & BARKER MFG. COMPANY
WEST SPRINGFIELD, MASS.

FOR SALE

2—Model #712J Osborn jolt squeeze machines (practically new)
1—Model #93 Osborn core blower (very good condition)
1—Model #341 Farquhar belt type under car unloader. (Good condition)

THE NATIONAL SANITARY CO.
SALEM, OHIO

FOR SALE

One used type NS, 10 lbs., 10 KW, Detroit Electric Furnace. Address: THE INVESTMENT CASTING CO., 319 CHESTNUT ST., NEWARK 5, N. J.

FOR SALE

1—American Wheelabrator 48" swing type table shot blast machine complete with motors and controls. Like new—used 2 months. Price $3,500.00. Address: EATON MANUFACTURING COMPANY, VASSAR, MICHIGAN.

CLASSIFIED ADVERTISING

For Sale

EQUIPMENT FOR SALE

1—Stroman #300-400 oil fired hydraulic tilt, nose pour crucible furnace. Practically new condition. Complete.

1—Simpson mixer #0, complete with gear reducer and motor. Very good condition.

C. H. KNAPPENBERGER
14365 WYOMING AVENUE
DETROIT 21, MICHIGAN

FOR SALE

Sand cutter 79/60, American model M, serial No. M 298. All electric—220 V, A-1 condition. Address: EMPIRE PATTERN AND FOUNDRY CO., BOX 1647, TULSA, OKLAHOMA.

FOR SALE

1—1000 lb. Sklenar furnace, gas fired for brass complete with blower and 440 volt motor. Good Condition. Offer for sale due to diversity of alloys we must now run. Address: ROCK ISLAND METAL FOUNDRY, ROCK ISLAND, ILLINOIS.

FOR SALE

1—Upright porter cable belt sander, 3" ¾ HP motor; 1—Globe hex. tumbling bbl. 3 HP motor, size 16" x 28"; 1—Norton tilting furnace: 400 lb. cap. Aluminum. Open top. Address: RAY WICKLEIN, 30C. MEADOWBROOK PL., MAPLEWOOD, N. J.

For Sale

DETROIT ELECTRIC FURNACE

Type LFA—size 350 rocking type complete with transformer, panels, etc.

DALEY & SIBLEY
99 WOOD ST. WEST HAVEN, CONN.

FOUNDRY SANDBLAST ROOM

Ruemelin 10' x 10'. Used 3 weeks. Complete with 10 cu. ft. generator, automatic abrasive handling system, dust collector, blower and motor. Will sacrifice at $3500.00.

WM. R. SHIELDS CO.
G.M. BUILDING DETROIT 2, MICHIGAN

FOR SALE

1 Stroman twin burner, oil fired melting furnace, 600# capacity. Price $850.00.

1 40# Detroit rocking furnace, used approximately 30 heats. Complete $1800.00.

BUCK IRON CO.
ROUTE #1 QUARRYVILLE, PA.

FOR SALE

X-ray, industrial for nonferrous metals. 150 Kilovolt keleket, complete with tube stand, remote control panel, transformer and rectifiers, developing tank, viewers, etc.

SAMUEL GREENFIELD CO., INC.
31 STONE STREET BUFFALO, NEW YORK

WHEELABRATOR

American Wheelabrator tumblast 36 x 42, with loader and dust collector. 220-440-60 cycle. Address: ABC CORPORATION, 3412—10th ST., LONG ISLAND CITY 6, N. Y.

For Sale

FOR SALE

The equipment listed is almost new and priced to sell!!

1—Osborn Type 405-77 jolt rollover and pattern draw—size—64" x 50"—with runout car.

6—Osborn type 2047—jolt rollover and pattern draw—size—24" x 24".

2—International clamp and draw—76" x 9½" draw.

1—Kane and Roach core wire straightener—No. 5 DX-⅜" capacity.

All equipment can be inspected at our warehouse and immediately available.

GLOBE TRADING COMPANY
1817 FRANKLIN STREET
DETROIT 7, MICHIGAN
PHONE: WOODWARD 1-8277

FOR SALE

TURBO BLOWERS (3 Phase, 60 Cycle)

cfm	Pressure	Make	Motor H.P.	Volts	Speed
3500	40 oz.	Spencer	60	440	1800
1000	32 oz.	Spencer	15	220	
900	24 oz.	Spencer	10	220/440	
225	10 oz.	Spencer	1	220/440	3600
PRESSURE BLOWERS (3 Phase, 60 Cycle)					
2500	7 oz.	Sturtevant	15	220/440	1800
2400	14 oz.	Mahr	15	220/440	3480
1800	1 in.	Sturtevant	2	220/440	
1000	12 oz.	Nth.Amer.	5	220	3600
950	16 oz.	Nth.Amer.			
800	8 oz.	Nth.Amer.	3	220	3600
800	24 oz.	American	10	220	3600
667	8 lb.	AllenBillmyre	50	220	3560
450	6 lb.	A&B	30	220/440	3450
400	4.3 oz.	Spencer	2	220/3/60	3500
340	20 oz.	AllenBillmyre	3	440	3600
275	16 oz.	Nth.Amer.	2	220	3600
150	12 oz.	Nth.Amer.	1	220	3600

CLEVELAND, OHIO
MOTOR REPAIR & MFG. CO.
1552 HAMILTON AVENUE

LIQUIDATION SALE BY PUBLIC AUCTION

we will on TUESDAY, MAY 15, 1951, at 10:30 A.M. offer for sale by PUBLIC AUCTION

THE LAND, BUILDINGS, MACHINERY AND EQUIPMENT OF G. W. VANDERVORT COMPANY

(Manufacturers of Cast Iron Soil Pipe) Located At

CHARLES STREET AND NORFOLK AND WESTERN RAILWAY CO., PORTSMOUTH, OHIO

(on the premises)

DESCRIPTION OF LAND AND BULDINGS

The site consists of a tract of land of approx. 20.8 acres located on the bank of the Ohio River, between the tracks of the Norfolk and Western Railroad and the river about two miles east of the business center of Portsmouth, Ohio inside the city limits. The land has a frontage of approx. 587' on the wall which parallels the river and approx. 33' on an unnamed alley to the north and abuts the east end of Charles St. on the west boundary. There is a rail service on the property with about 1,100' of siding constructed within the past two years. The building constructed in 1946-47 consists of a rectangular one story steel frame cinder block structure measuring 123' by 273' and containing about 34,000 sq. ft. The roof is supported by long span trusses with high areas over the melting and sand preparation equipment. Clearance under the main span is 17' and over the cupolas is 49' and over the sand preparation area is 53'. The roof deck is concrete slabs with asphalt water proofing, supported by steel purlins. There is a crane runway the full length of the structure which supports a 10 ton electric overhead traveling crane with a 40' clearance to the runway rail, and has a 75' span. As a whole the building is comparatively new and there has been no appreciable deterioration.

IMPORTANT NOTICE: This is a specialty plant and the equipment was designed and laid out for the production of cast iron soil pipe on a high volume, low cost basis. The present equipment consists primarily of two 10 ton cupolas, for melting with no supplementary refining or control. There is modern sand preparation and return equipment and two modern speed draw machines with an automatic stationary sand slinger for molding. The molds are moved to the pouring area and then to shake out on transfer cars operated periodically by means of hydraulic equipment.

DESCRIPTION OF EQUIPMENT

ROYERSFORD Tumbling Barrels 42" x 72"; Power Hack Saws; CHAMPION Jolt Squeeze Molding Machines; JARIS B. WEBB Conveyors for dipping & drying 448' lg., 2 drive units; STANDARD #33 Heavy duty single end snagging grinders; Monorail carriers #1; BEARDSLEY & PIPER CHAMPION #30 Speed Mullers; 5 ton plate feeders; 10 ton plate feeders; Cyclone dust collectors from tumbling barrels with blower, motor and ducts; 1-Ton overhead traveling crane with 2-load lifter electric hoists cat. #1178—Cap. 1 ton each; JACKSON & CHURCH Transfer cars; RACINE TOOL & MACH. Hydraulic pump units; PUROX Oxo Acet. welding sets; F. B. STEVENS Elec. sand riddles #8; INGERSOLL-RAND 1 Ton air hoists; MATHEWS CONVEYOR CO. 12" roller conveyors—140' lg.; GEN. ELEC. 50 KVA Transformers; WHITING CORP. 7½ Ton Elec. Bridge Cranes 75' span; 5-Ton charging cranes 26' span; GEN. ELEC. SUPPLY 231' of enclosed bus bar; WHITING CORP. Hydraulic Systems for weigh hoppers; Cupola blower motors & controls; INGERSOLL-RAND Compressors 13½" x 8" x 8"; 2 KW Generators—Exciters; INGERSOLL-RAND After coolers—#8 Vertical; CLEV. MET. HARD. BELT #1 Elevator—65' high; H. W. DIETERT CO. Sand Rammers; ELEC. SERVICE CO. 500 KVA Transformers and other items too numerous to mention.

THE ABOVE WILL BE OFFERED IN BULK, UNITS AND PIECEMEAL LOTS

TERMS OF SALE: Certified check or cash—25% deposit required. The Reconstruction Finance Corporation will finance up to a maximum of 66 2/3% of the successful bulk bid only. General reputation and financial responsibility of the successful bulk bidder will be a requisite to confirmation.

ALL SALES SUBJECT TO CONFIRMATION **INSPECTION: FROM MAY 8, 1951 TO DATE OF SALE**

For Further Information Inquire of

ROSEN & COMPANY

Auctioneers—Liquidators—Appraisers
1608 N.B.C. Bldg. MAin 1-1861 Cleveland, Ohio

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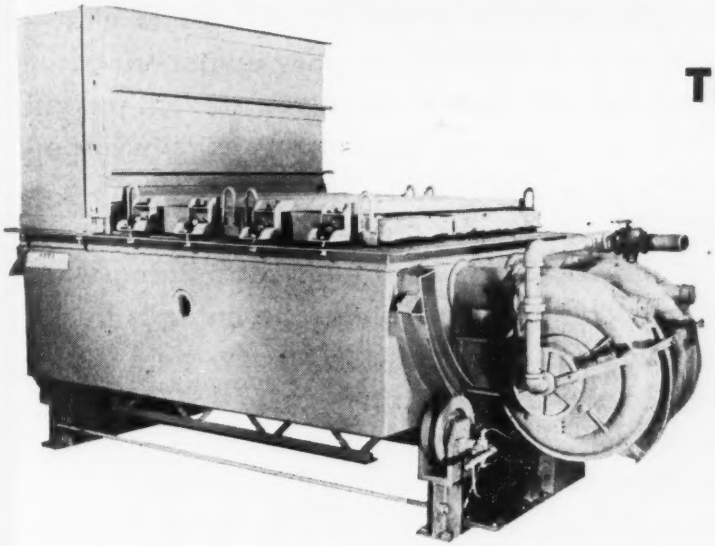


THE NEW 1000 SERIES

REDA

REFLECTING TYPE DIRECT FIRED MELTING

FURNACE

Performance and economy are the keynotes of the new Reda Reflecting Type Direct Fired Melting Furnace for ferrous and non-ferrous metals. Advantages sought by all foundry owners, both large and small, are inherent in these cleanly designed, highly efficient furnaces.

These advantages will be yours with a Reda Furnace:

1. Low First Cost.
2. Fast Heat — High Heat: 30 minute preheat; full charge gray iron ready to pour 25 minutes after charging; full charge brass or bronze ready to pour 15 minutes after charging.
3. Operating Economy: Highly efficient fuel mixer and proper chamber design provide lowered fuel costs.
4. Greatest number of heats without interruption.
5. Maintenance: New type lid allows quick and easy entry to furnace for refractory maintenance.
6. Low decible noise level.
7. Will best comply with health requirements of intra-city installation.

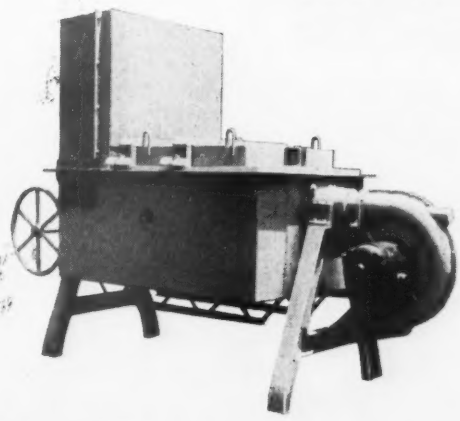
GAS OR OIL FIRED

The New Reda Burner arrangement can operate from both fuels simultaneously or be switched from one fuel to the other in an instant.

SERIES	CHARGE		MELT. CAP./HR.	
	IRON	BRASS	IRON	BRASS
400	400 #	450 #	1020 #	1350 #
550	550 #	625 #	1375 #	1850 #
1000	1000 #	1125 #	3000 #	4000 #

LARGER MODELS ON REQUEST

***400* Series**



Phone or Write for Complete Details

REDA PUMP CO.

BARTLESVILLE, OKLAHOMA

A 6" POT FOR BRASS...
and this 6-Ton Bottom Pour for Steel..

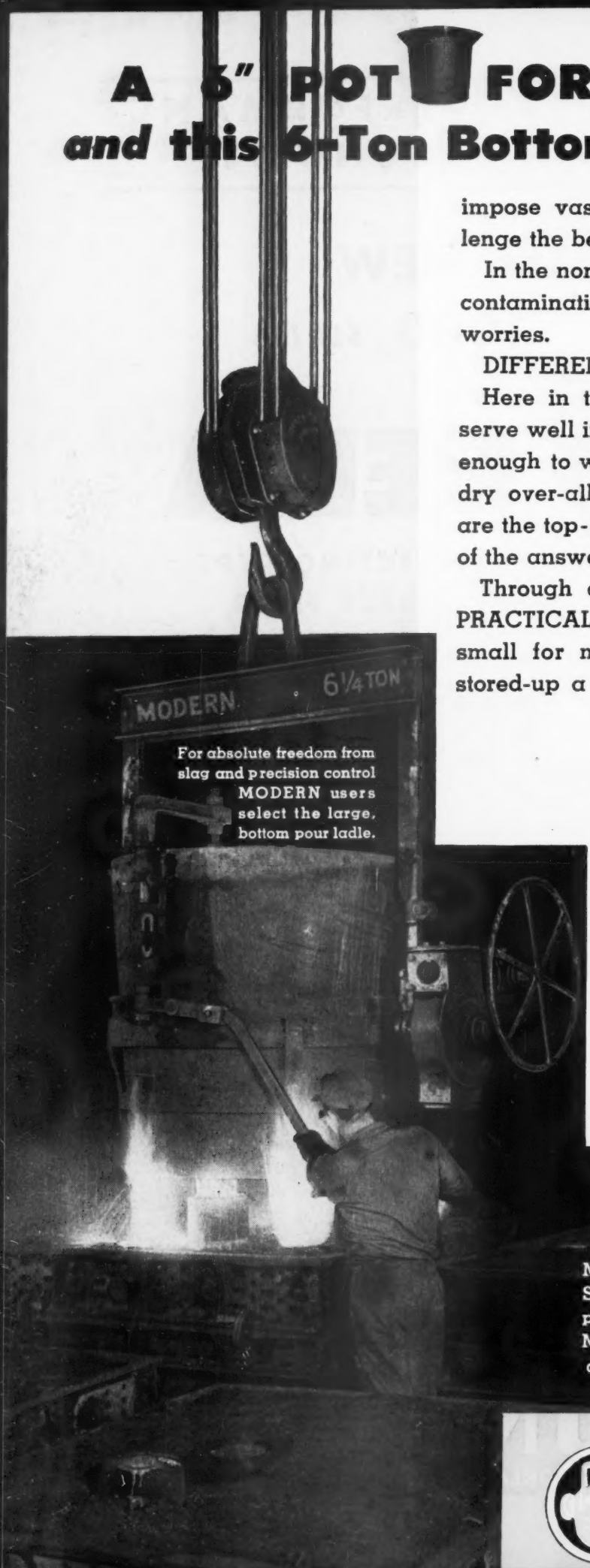
impose vastly different pouring problems to challenge the best in specialized, foundry engineering...

In the non-ferrous foundry, lining to prevent metal contamination is one of the superintendent's top worries.

DIFFERENT is the making of steel castings.

Here in the steel foundry almost any lining will serve well if contour is right and if the lining is thick enough to withstand the heat. BUT in the steel foundry over-all ladle balance and speed in slagging are the top-spot considerations. MODERN has some of the answers:

Through closely WORKING TOGETHER WITH PRACTICAL FOUNDRYMEN, in foundries large and small for more than thirty years, MODERN has stored-up a wealth of over-all professional, foundry "know-how!" It's FREE for the asking: Ladles are described in catalog 149...chargers and cupolas in catalog 147-A...cranes and monorail 150...and Pouring Devices are covered in catalog 147. Foundry superintendents can reserve copies by writing on their company letterheads to Dept. F-5, MODERN EQUIPMENT COMPANY, PORT WASHINGTON, WISCONSIN.

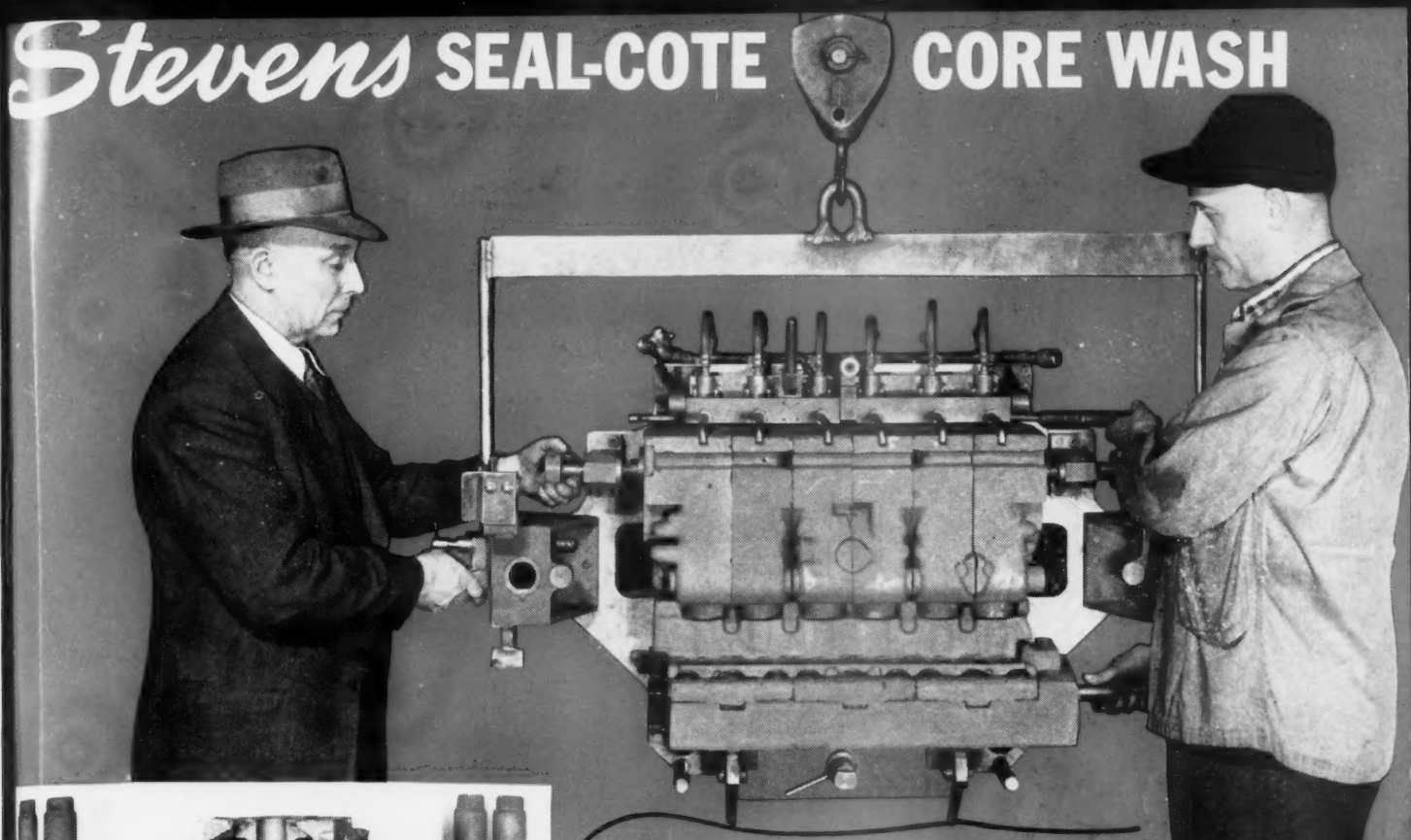


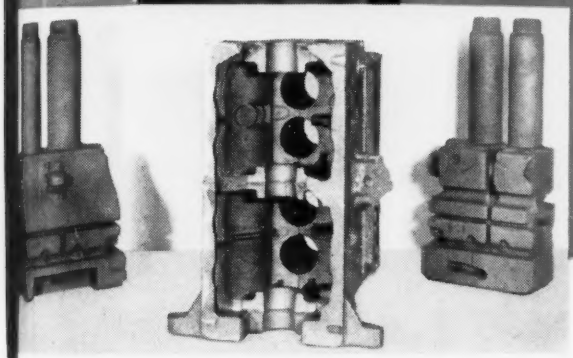
For absolute freedom from slag and precision control MODERN users select the large, bottom pour ladle.

Modern 58" bottom pour ladle at Maynard Electric Steel Casting Company, Milwaukee, is helping to pour 100 tons of steel in a 'round-the-clock operation. Molds poured here take from 2000 to 12,000 pounds of steel, each, for excavator carbodies.

MODERN EQUIPMENT CO.
PORT WASHINGTON, WISCONSIN

Stevens SEAL-COTE CORE WASH





PREVENTS METAL SEEPAGE
GIVES SMOOTHER CASTINGS
REDUCES SALVAGE

REPORTS WILSON FOUNDRY & MACHINE CO.

Wilson Foundry & Machine Co., Pontiac, Mich., faced a problem in their core room several months ago. The core wash they were using had a tendency to glaze and bubble under high temperatures. Salvage was high due to sand spots—castings came out rough and pitted. So, Wilson Foundry & Machine Co. called in a representative of Frederic B. Stevens, Inc., and told him of their problem. The Stevens man, working closely with the Stevens laboratory and research staff, submitted several samples of core wash. Foundry tests proved that Stevens Seal-Cote Core Wash held the answer to the problem. According to R. E. Kalmbach, Wilson's general manager, since the foundry started using Stevens Seal-Cote Core Wash for automobile engine castings, results have been splendid. "Stevens Seal-Cote is a better filler, gives better coverage, and in general does an all-around better job than other core washes we've used," Mr. Kalmbach states. He adds, "And the Stevens organization gives top-notch service. You can call on the Stevens people at any hour, day or night, and get immediate action on foundry problems."

The Stevens complete line of foundry equipment and supplies stands ready to serve you in your casting operations. Why not call in your nearby Stevens representative today and have him show you how Stevens can help with any foundry problem. Or, if you prefer, write direct to Frederic B. Stevens, Inc., Detroit 16, Michigan, for full information. There's no obligation.

EVERYTHING FOR A FOUNDRY

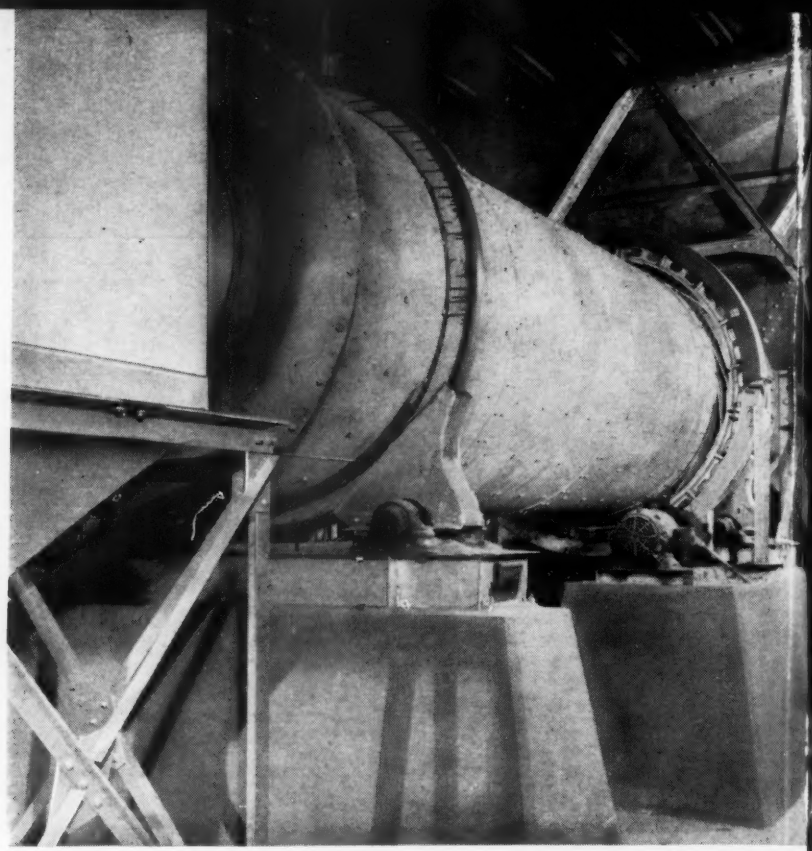
FREDERIC B. STEVENS INCORPORATED

BRANCHES • SALES OFFICES
BUFFALO • NEW HAVEN • INDIANAPOLIS • CLEVELAND
Representatives in Principal Cities

DETROIT 16, MICHIGAN

FREDERIC B. STEVENS OF CANADA, LTD.
WINDSOR • TORONTO
ONTARIO

Get more dry, cool sand... in less floor space



Drying 10 tons of core sand per hour, this Link-Belt Roto-Louvre Dryer is use with a gas-fired furnace and dust-collecting system.

LINK-BELT Roto-Louvre Dryer delivers large volume of dry sand ... at cool discharge temperatures

MODERN, mechanized foundries require cool, dry sand for cores and molds . . . and lots of it! High capacities call for high temperatures. And with ordinary dryers that means an extra cooler — or sand so hot it won't mix properly with core oil and is difficult to handle.

But not with Link-Belt's Roto-Louvre Dryer! Here's a unique design that utilizes controlled high temperatures for high capacities . . . delivers sand at 120 to 130° F with a moisture content of only 0.5%. What's more, it takes only half the floor space required by other drying equipment.

Book 1911-A has the complete story on Roto-Louvre Dryers. Or you can get all the facts from your Link-Belt foundry specialist.

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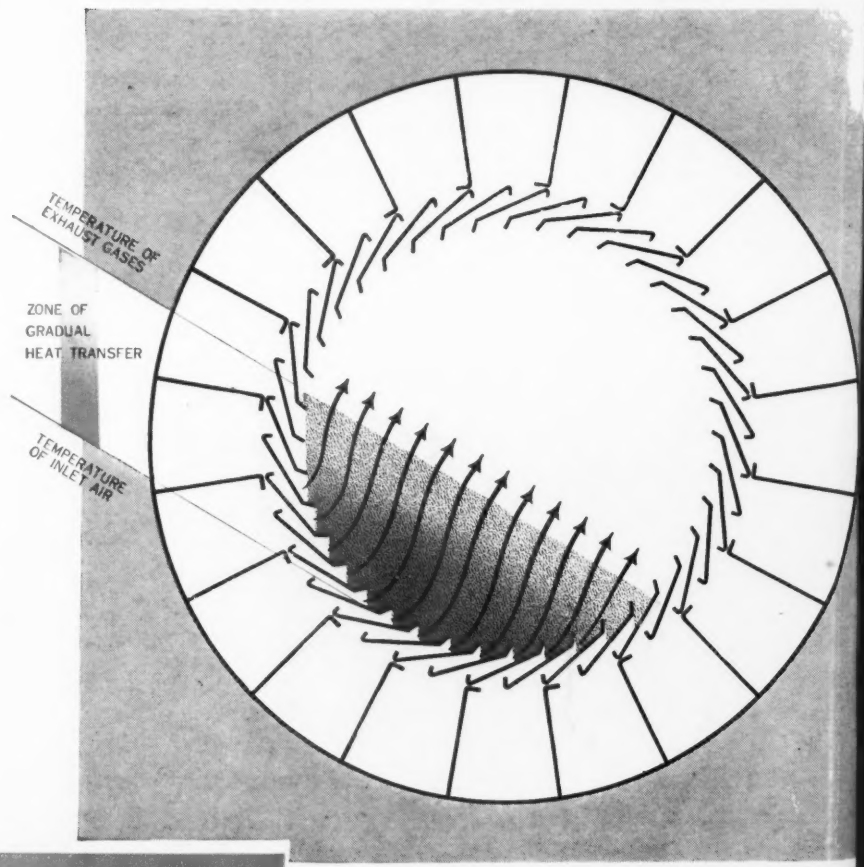

Gradual Heat Transfer Assures Uniformly Dry Sand

Gentle rolling action over slowly revolving louvres results in uniform treatment, thereby eliminating spotty over- or under-drying. Gradual drying of the sand, as it progresses through the Roto-Louvre Dryer, affords a uniform moisture content of the product at a low final temperature.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities.

LINK-BELT

HANDLING and SAND PREPARATION MACHINERY